HERTZBERG-NEW METHOD, INC. / Vandalia Road, Jacksonville, Ill.

ST-4

TITLE NO./RUB/S.B.	ACCOUNT NO.	LOT AND TICKET NO.
	5640-1	15A-44

DO NOT WRITE IN ABOVE SPACE

11

CLOTH COLOR BROWN

COLOR LETTERING WHITE GOLD BLACK

VOLS.

REMOVE ADS YES NO X

REMOVE COVERS YES NO X

CHARGING INFORMATION

STUBBING

HAND SEW

THRU SEW

THRU SEW ON TAPE

AND ADHESIVE

NGTHWISE

REIGN TITLE

INES OF LETTERING

FRONT COVER

NO TRIM

PAGES LAMINATED

EXTRA THICKNESS

MAP POCKET PAPER

MAP POCKET CLOTH

SPECIAL WORK

LETTERING FOR SPINE

STATUS OF RUFFED GROUSE REINTRODUCTIONS IN ILLINOIS W-63-R(SI)-32 STUDY VII

VOL.

MO.

YR. 1990

CALL NO. CWRL

HEIGHT 11 1/4

PICA 3

WRAP

SPECIAL INSTRUCTIONS

3 st

11

2 PLEASE PEEL OFF AT EXTENDED SHEETS AND SEND COPIES 1 AND 2 (HELD TOGETHER) TO BINDERY NUMERICALLY ARRANGED.

30

FINAL REPORT

W-63-R(SI)-32, Study VII

STATUS OF RUFFED GROUSE REINTRODUCTIONS IN ILLINOIS

Submitted by:

Cooperative Wildlife Research Laboratory, SIU-C

Presented to:

Illinois Department of Conservation

July, 1990

Prepared by:

Peter B. Sharpe

Peter Sharpe, Research Assistant
Southern Illinois University
Carbondale, IL 62901

Approved by:

Alan Woolf, Director
Southern Illinois University
Carbondale, IL 62901

TABLE OF CONTENTS

FINAL REPORT

STATE OF ILLINOIS

W-63-R(SI)-32, Study VII

Project Period: July 1, 1987 through June 30, 1990

Study Title: Status of ruffed grouse reintroductions in Illinois

Prepared by Peter Sharpe and Alan Woolf

Cooperative Wildlife Research Laboratory

Southern Illinois University at Carbondale

Need:

Attempts to reintroduce ruffed grouse (*Bonasa umbellus*) to historic ranges in a number of Midwestern states have met with varying success. Factors that influence restocking success are not clear, hence, the outcome of any effort is not predictable. In Illinois, 3 past attempts have failed to produce viable populations. The fate of a recent reintroduction (1982-83 Union County) has been documented (Woolf et al. 1984), including recruitment and dispersal rates (Norris 1986). The final outcome of a supplemental release in 1986 is unclear. Lacking this knowledge, managers cannot properly plan supplemental releases.

Achievement of management goals in areas of Illinois that include suitable habitat requires that the fate of releases be monitored to determine survival, reproduction, and dispersal into unoccupied habitats. Such information is essential to judge the status of previous releases and to determine if new release areas should be selected, or if additional releases are warranted in the vicinity of previous ones. The effectiveness of spring drumming surveys to detect birds present must be evaluated if they are to be used as a population monitoring technique. Furthermore, evidence of sufficient annual recruitment to offset documented mortality rates and dispersal are required to judge the success of any reintroduction effort.

JOB A. Fall Juvenile/Adult Ratios

Objective: To determine fall juvenile/adult ratios in the vicinity of the 1982, 1983, and 1986 Union County release sites as a measure of recruitment.

INTRODUCTION

Historically, ruffed grouse ranged as far south as Arkansas, including Illinois, Missouri, and Indiana (Aldrich 1963). The last ruffed grouse hunting season in Illinois was in 1899; few sightings have been reported in southern Illinois since (Woolf et al. 1984).

Restoration attempts have been made in several states in the southern portion of ruffed grouse range. Those in Illinois began in Pope County in 1955-58 when at least 171 wild birds from Michigan and Wisconsin were released in the Belle Smith Springs Area. A second restoration attempt was made in 1967 at Lusk Creek Canyon in Pope County with the release of 31 birds from Ohio. A third attempt was made in 1972-73 when 55 birds from Indiana were released in Alexander County (Woolf et al. 1984). Although some releases were initially promising and some sightings are still reported from Pope and Alexander counties, viable populations were not attained. Possible factors causing these failures were:

1. Release stock (1955-58 genetically unsuited for climate and vegetation of the release area.
2. Lack of adequate numbers of birds (1967, 1972-73) to insure sufficient breeding stock.
3. Lack of careful planning in selection of release sites (1955-58, 1967, 1972-73) (Norris 1984).

Due to successful ruffed grouse restoration efforts in Missouri (Lewis et al. 1968) and Indiana (Backs 1984) and the believed causes of previous failures, the Illinois Department of Conservation (IDOC) biologists felt that there was justification for another restoration attempt. During 1982-83, birds trapped in Indiana were released in Union County. A larger number (120 in 1982, 22 in 1983) were released to offset emigration and mortality and result in sufficiently high breeding densities in initial years. Quality

habitats were also selected as release sites (Norris 1984). A supplemental release of 71 grouse from Indiana was made in 1986 in the vicinity of the 1982-83 releases.

In order for a reintroduction to be successful there must be enough recruitment to offset mortality and dispersal. Norris (1986) estimated the fall to spring survival in the 1982 Union County release area to be 25% for radio-collared birds. A fall to spring survival rate of 45% was calculated for males from intensive drumming route surveys. These survival rates fall within the range of those found in other states with successful reintroductions. For instance, Kurzejeski and Root (1988) estimated fall to spring survival to be 24.5% in northern Missouri where 77 ruffed grouse from Indiana were released in 1986.

Although survival is normal for this area, reproduction does not appear to be replacing "normal" fall to spring mortality (Woolf et al. 1984). Between 1983 and 1984 only 4 nests were found. From these, only 18 eggs from 2 nests hatched (8 in 1983, 10 in 1984). Brood sizes 2 months after hatching were 4 of 8 in 1983 and 5 of 10 in 1984. An additional brood of at least 5 was found by playing recordings of grouse chick distress calls (Norris 1986).

STUDY AREA

All trapping activities and monitoring of movements took place in an approximately 32 km^2 area located in T12S., R2W. and T13S. R2W. of the Shawnee National Forest, Union County, Illinois. The topography is generally steep (30-70% slopes) with elevations ranging from 110 to 250 m above sea level. The area is composed primarily of a Goss-Alford complex with well drained soils on the hills and ridges. Average yearly temperatures are 13.8° C (average January and July temperatures of 0.7° C and 25.6° C, respectively) with annual precipitation averaging 116.2 cm (34.5 cm average snowfall) (Miles et al. 1976). The average growing season ranges between 185 and 200 days, with the first and last killing frosts occurring about 24 October and 10 April, respectively (Voigt and Mohlenbrock 1964). The forest has been heavily disturbed by cutting, fire, and grazing. Most of the level land was cleared

and farmed until the mid-1930s, at which time it was abandoned and subsequently purchased by the U.S. Forest Service. There are currently areas in various stages of succession, with substantially recovered mature forests on steeper slopes (Fralish 1987).

The area is a mixed oak-hickory association (U.S. Forest Service 1986) which lies in the Western Mesophytic Forest Region (Braun 1950). Mature woodlands are dominated by white oak (Quercus alba), black oak (Q. velutina), pignut hickory (Carya glabra), sweet pignut hickory (C. ovalis), hop hornbeam (Ostrya virginiana), and sassafras (Sassafras albidum) on the uplands; and northern red oak (Q. rubra), yellow poplar (Liriodendron tulipifera), cottonwood (Populus deltoides), beech (Fagus grandifolia), and sycamore (Plantanus occidentalis) on the lowlands. The study site contains 37 regenerating clearcuts, 2 to 20 years old, composed primarily of sassafras, dogwood (Cornus florida), hop hornbeam, yellow poplar, red and white oak, and mixed hickory species (Norris 1986).

METHODS

Clover leaf traps were set out during the falls of 1987-89 within and around the 1982, 1983, and the 1986 Union County release areas (Figures 1 and 2). Trapping was conducted from 25 August to 16 October 1987 (24 traps); 12 September to 16 October 1988 (24 traps to 7 October, 16 traps 8-16 October); and 25 September to 27 October 1989 (10 traps). Trap sites used varied each season (Table 1). Each captured bird was sexed, aged, weighed and leg banded if necessary (Table 2).

Statistical analysis was performed with the SAS package (SAS Institute, Inc., Cary, NC) using a significance level of 0.05.

RESULTS AND DISCUSSION

Total trapping effort was 958, 689, and 325 trap days for the falls 1987-89, respectively. Trapping efficiency did not vary significantly between 1987 and 1989 (1 bird/29.9 trap days in 1987, 1 bird/32.5 trap days in 1989, P=.7754), but the efficiency was significantly lower in 1988 (1 bird/229.7

Table 1. Ruffed grouse trap sites operated in Union County, Illinois, Fall 1987-89.

TRAP SITE	YEAR(S) OPERATED	NUMBER OF CAPTURES 1987	1988	1989
Atwood Ridge #1	1987	1	-	-
Atwood Ridge #2	1987	1	-	-
Atwood Ridge #3	1987-89	0	1	0
Big inch '88	1988	-	0	-
Clear Creek #1	1988	-	0	-
Clear Creek #2	1988	-	0	-
Dutch Creek #1	1987-89	1	1	0
Dutch Creek #2	1987-89	1	0	2
Dutch Creek #3	1987-89	6	0	0
Dutch Creek #4	1987-88	2	0	-
Dutch Creek #5	1987-89	2	0	1
Dutch Creek #6	1988-89	-	0	1
Harrison Creek 1N #1	1987	0	-	-
Harrison Creek 1N #2	1987	0	-	-
Harrison Creek 1N #3	1987-88	4	0	-
Harrison Creek 2N #4	1987	0	-	-
Harrison Creek 2N #5	1987	0	-	-
Harrison Creek 3N #1	1987-88	0	0	-
Harrison Creek 3N #2	1987-88	0	0	-
Harrison Creek 3N #3	1987-88	0	0	-
Lingle Creek #1	1987-89	9	0	3
Lingle Creek #2	1987-89	3	0	0
Lingle Creek #3	1987-89	3	0	0
Lingle Creek #4	1987-89	0	0	3
Pine Knob #1	1987-88	1	0	-
Pine Knob #2	1987-88	1	1	-
Pine Knob #3	1987-88	0	0	-
Pine Knob #4	1987-88	0	0	-
Pine Knob #5	1988	-	0	-
Silica Mine	1988	-	0	-

Table 2. Ruffed grouse capture data, Union County, Illinois, August 1987 - October 1989.

TRAP DATE	LOCATION	AGE	SEX	WEIGHT(g)	BAND#	RADIO FREQ. (148.---)	COMMENTS
8/26/87	DUTCH CREEK #3	A	M	590	333	230	Released Dutch Creek 1986
8/27/87	LINGLE CREEK #2	J	F	450	401	330	
8/28/87	LINGLE CREEK #2	A	M	580	373	---	Released Lingle Creek 1986
8/28/87	LINGLE CREEK #2	J	F	520	402	056	
8/29/87	HARRISON 1N	A	M	650	377	---	Released Harrison 1N 1986
8/29/87	HARRISON 1N	A	F	580	56-IL		
					G2812-IN	154	Released Dogwood Flats 1982
8/30/87	LINGLE CREEK #2	J	F	---	402	056	Recapture
8/30/87	DUTCH CREEK #3	J	M	450	426	076	
9/4/87	DUTCH CREEK #2	A	M	560	427	379	
9/14/87	DUTCH CREEK #5	A	M	605	302	358	Released Dutch Creek 1986
9/16/87	PINE KNOB #2	A	M	600	151	311	Released Pine Knob 1986
9/22/87	DUTCH CREEK #3	A	F	---	428	---	
9/22/87	DUTCH CREEK #3	J	F	415	429	408	
9/23/87	DUTCH CREEK #4	J	M	500	430	202	
9/26/87	ATWOOD RIDGE #1	A	M	560	184	131	Released Dutch Creek 1986
9/27/87	DUTCH CREEK #5	A	F	480	431	---	
9/27/87	LINGLE CREEK #3	J	M	565	403	230A	
9/28/87	ATWOOD RIDGE #2	A	M	---	384	---	Released Harrison 3N 1986
10/1/87	DUTCH CREEK #3	A	F	---	313	---	Released Dutch Creek 1986
10/1/87	LINGLE CREEK #2	J	F	500	404	---	
10/2/87	LINGLE CREEK #2	A	M	645	385	---	Released Lingle Creek 1986
10/3/87	PINE KNOB #1	A	M	690	G2825	---	Released Pine Knob 1986
10/4/87	LINGLE CREEK #3	J	M	---	403	230A	Recapture
10/4/87	LINGLE CREEK #4	A	M	---	405	---	
10/5/87	HARRISON 1N	J	F	550	406	257	
10/7/87	HARRISON 1N	J	M	650	407	281	
10/8/87	DUTCH CREEK #1	A	F	---	352	---	Predator kill in trap. Released Dutch Creek 1986
10/8/87	DUTCH CREEK #3	A	F	---	303	---	Predator kill in trap. Released Dutch Creek 1986
10/8/87	DUTCH CREEK #4	A	M	---	302	---	Recapture
10/12/87	PINE KNOB #1	A	M	---	198	---	Predator kill in trap. Released Pine Knob 1982
10/12/87	LINGLE CREEK #2	J	M	---	403	230A	Second Recapture

Table 2. Continued

TRAP DATE	LOCATION	AGE	SEX	WEIGHT(g)	BAND#	RADIO FREQ. (148.---)	COMMENTS
10/15/87	LINGLE CREEK #2	?	F	---	---	---	Predator kill in trap
9/17/88	PINE KNOB #2	A	F	520	826	---	
9/26/88	DUTCH CREEK #1	A	M	580	427	301	Recapture. Originally banded Dutch Creek 1987
10/10/88	ATWOOD RIDGE #3	A	M	590	827	011	
10/5/89	DUTCH CREEK #2	J	M	560	907	431	
10/5/89	DUTCH CREEK #2	A	M	620	427	061	Second recapture. Originally banded Dutch Creek 1987
10/5/89	DUTCH CREEK #5	J	F	540	908	451	
10/11/89	DUTCH CREEK #6	A	F	615	180	103	Released Dutch Creek 1986
10/13/89	LINGLE CREEK #2	A	F	520	910	---	
10/15/89	LINGLE CREEK #2	J	M	625	914	431	
10/19/89	LINGLE CREEK #4	J	F	570	912	139	
10/19/89	LINGLE CREEK #4	J	M	600	913	010	
10/22/89	LINGLE CREEK #4	J	F	490	802	---	
10/27/89	LINGLE CREEK #2	J	F	515	912	---	Recapture

trap days, P=.0001). Between 3 and 32 captures were made during the 3 trapping seasons (Table 2). The extremely low trapping efficiency and number of captures during the 1988 season may have been due to summer drought which may have caused the birds to shift their habitat use to areas where water was available.

Juvenile/adult ratios also varied among the 3 trapping seasons. The juvenile/adult ratio of captured grouse was 0.5 in 1987 (12 adult and 4 juvenile males; 6 adult, 5 juvenile, and 1 unknown female); 0.0 n 1988, as we captured only 3 adult grouse (2 males, 1 female); and 2.0 in 1989 (1 adult and 3 juvenile males; 2 adult and 3 juvenile females). Neither the juvenile/adult or sex ratios were found to differ significantly ($p > .05$ and $p > .7$, respectively) (Table 3). Although there was evidence of reproduction, recruitment did not appear to be great enough to replace losses from natural mortality.

Mortality was very high in some years. At least 6 of 7 juveniles radio-collared during trapping in 1989 died before spring 1990. This mortality rate is well above the 50% annual mortality rate reported by Bump et al. (1947) for birds captured in the fall.

Additional recruitment was also demonstrated each season by the capture of previously unmarked adults. Unbanded adults made up 22%, 66%, and 33% of the adults captured in 1987-89, respectively (Table 2). These birds represent either immigrants from outside the release areas (which is improbable) or birds surviving from broods produced at least 2 breeding seasons prior to the trapping year. It appears that recruitment in Union County is sufficient to allow the population to persist, although apparently not enough to significantly increase the population size. Continued monitoring of fall juvenile/adult ratios and trapping success is necessary to determine the success of reintroduction efforts in Union County.

JOB B. <u>Juvenile Dispersal and Habitat Utilization</u>

Objective: To determine distance and direction of juvenile dispersal and identify habitats they select.

Table 3. Trapping success and age ratios of captured ruffed grouse, Union County, Illinois, 1987-89.

YEAR	TOTAL TRAP DAYS	TRAPPING SUCCESS	JUVENILE ADULT RATIO	TOTAL CAPTURES	INDIVIDUALS CAPTURED
1987	958	1 BIRD/ 29.9 DAYS	0.5 (9/18)	32	28
1988	689	1 BIRD/ 229.7 DAYS	0.0 (0/3)	3	3
1989	325	1 BIRD/ 32.5 DAYS	2.0 (6/3)	10	9

INTRODUCTION

Ruffed grouse are non-migratory, but some dispersal is characteristic throughout their range (Godfrey and Marshall 1969). There are 2 phases of dispersal: brood break-up and fall dispersal.

From 12-15 weeks after hatching, growth rate slows as young grouse prepare for solitary life. The young spend more time foraging independently of their mother and siblings, although they remain within the original brood range. This phase is termed "brood break-up" (Johnsgard et al. 1989). Brood break-up is not a sudden event, but instead occurs over about a 2 week period. Several stimuli have been suggested which may trigger this break-up, including photoperiod, meteorological changes, or age specific responses (Godfrey and Marshall 1969). Many believe that changes in day length trigger hormonal activity which promotes aggressive tendencies and increased intolerance among brood members. The break-up proceeds gradually, indicating a possible deterioration of social bonds among siblings (Johnsgard et al. 1989).

The second phase, fall dispersal, takes place around week 16 or 17. The young grouse disperse from their brood range to establish new home ranges of their own. Dispersal serves to spread out family members, enhance outcrossing, and ensure genetic variation among prospective mates. Dispersal usually begins in mid-September in the upper Midwest and New England and slightly later in more southern regions (Johnsgard et al. 1989).

Although not all juveniles disperse, those that do tend to make major movements over about a 4 day period and move an average of approximately 3 km (Godfrey and Marshall 1969). The exact distance of dispersal can vary greatly, but Chambers and Sharp (1958) found that 59% of dispersing grouse in Pennsylvania moved more than 1.6 km, with a maximum movement of 12 km. Hale and Dorney (1963) reported that 25% of their marked juveniles in Wisconsin moved more than 1.6 km. They also documented one of the longest movements recorded, a 114 km move by a juvenile female. Their findings showed that females are consistently more mobile than males, except in the winter.

Juvenile females tend to disperse 4 to 4.8 km; males 1.9 to 3.1 km (Johnsgard et al. 1989).

Young grouse are less selective in their habitat during the fall dispersal and may be found in a variety of habitat types. Several explanations are possible: the young may be unable to enter territories of established adults, or inexperienced in identifying ideal habitats, or simply passing through (Johnsgard et al. 1989).

Areas with high stem densities are believed to provide the best habitat for grouse. Optimal winter cover in northern forests is young aspen stands with about 14,000-20,000 stems/ha. These stands provide predator protection, nearby food (mature aspen), and deep snow for roosting (Thompson and Fritzell 1988). Grouse in southern regions also tend to use areas of higher stem density. In Tennessee, transplanted grouse primarily used areas of hardwood saplings and vines (Gudlin and Dimmick 1984). Reintroduced grouse in southern Illinois are commonly found in association with regenerating clear-cuts. Norris (1986) estimated stem densities of 16,917/ha in clear-cuts inhabited by grouse in Union County, Illinois, similar to those in northern regions.

METHODS

Fall Trapping (Union County)

Poncho-mounted radio transmitters were placed on a portion of the trapped birds to monitor movements and survival (Table 2). Each transmitter weighed approximately 1.6 - 3.0% of the bird's body mass. Locations were monitored regularly and recorded on 7.5 minute topographic maps.

1989 Release

Wild grouse were trapped in the Whitewater Wildlife Management Area and adjacent state and private lands in southeastern Minnesota from 9 August to 9 September 1989. Trapping activities were coordinated with the Minnesota Department of Natural Resources and staff of the Whitewater Wildlife Management Area. Seventy-eight of 128 grouse captured were kept for release in 3 sites in Illinois. Of the remaining 50 grouse, 3 died in the traps and 47 were young juveniles that were released in Minnesota due to anticipated

lower survival and productivity following relocation. One of the 78 grouse kept for release died of unknown causes in captivity prior to transportation to Illinois.

Sixty grouse (16 adult, 14 juvenile males; 12 adult, 18 juvenile females) were transported to Jo Daviess County in northwestern Illinois for release. This is the first attempted reintroduction of ruffed grouse to that portion of Illinois.

Seventeen grouse (3 adult males; 5 adult and 9 juvenile females) were transported to Union County in southern Illinois and released on 10 September (Table 4). Eight of these (5 adult and 3 juvenile females) were equipped with radio-collars to help monitor post-release dispersal, survival, habitat selection, and productivity.

RESULTS AND DISCUSSION

Dispersal was documented in 3 out of 8 juveniles (2 females, 1 male) radio-collared in 1987 (Figure 3). A juvenile male (Band #426) captured at Dutch Creek #3, 30 August, dispersed to Pine Knob and was relocated 12 December, a linear movement of 6.4 km. A juvenile female (Band #429), also captured at Dutch Creek #3, 22 September, dispersed to Harrison 1N and was relocated 12 December, a linear distance of 3.2 km. The other juvenile female (Band #402) was trapped at Lingle Creek #2, 28 August. Radio contact was lost 16 October and reestablished through aerial survey on 28 February, 4.0 km north of the capture site. Its transmitter was recovered from the periphery of a regenerating clearcut on 26 April. Radio contact was lost on 2 other juveniles (Bands #401, 430) 16 October and never reestablished. The remaining 3 radio-collared juveniles did not disperse.

Poor trapping success in fall 1988 precluded radio-marking an adequate number of birds to monitor dispersal and/or habitat utilization.

During fall 1989, only 2 of 5 radio-collared juveniles dispersed from their capture sites (Figure 4). Bird #908, captured on 5 October at Dutch Creek #5, moved 2.5 km west before radio contact was lost. Bird #914 was

Table 4. Data for ruffed grouse trapped in Minnesota and released in Union County, Illinois, September 1989.

AGE	SEX	BAND#	RADIO FREQ. (148.---)	RELEASE WEIGHT(g)	RELEASE CLEARCUT* (w/associated trap sites)
A	F	890	359	465	Dutch Creek 4 and 5
J	F	891	---	440	Dutch Creek 4 and 5
J	F	892	---	415	Dutch Creek 6
A	M	893	---	430	Atwood Ridge 3
A	F	894	207	440	Atwood Ridge 3
J	F	895	---	430	Atwood Ridge 3
J	F	896	389	430	Dutch Creek 4 and 5
J	F	897	139	430	Dutch Creek 6
A	M	898	---	620	Atwood Ridge 3
J	F	899	---	465	Dutch Creek 1 and 2
A	F	900	260	470	Dutch Creek 1 and 2
J	F	901	080	465	Atwood Ridge 3
A	F	902	105	440	Atwood Ridge 3
A	F	903	325	490	Atwood Ridge 3
J	F	904	---	440	Atwood Ridge 3
J	F	905	---	430	Atwood Ridge 3
A	M	906	---	575	Atwood Ridge 3

*See Figure 2 for clearcut locations

captured on 15 October at Lingle Creek #2. It was relocated 1.7 km northwest on 30 November by aerial survey and on 1 December from the ground. Its transmitter was recovered on 9 January on the periphery of a 4 year old clearcut. One juvenile was found dead the day after capture, possibly due to trap-related injuries. The remaining 2 juveniles displayed minimal dispersal. Their carcasses and/or transmitters were found in or near clearcuts on 22 April and 30 January, respectively.

Very limited dispersal was found among the juvenile ruffed grouse released from Minnesota. The largest moves were made by 3 of the 5 adult females (Figure 5). Bird #900 moved to a clear-cut about 3.1 km south of its release site before its signal was lost. Bird #890 moved 1.1 km northwest to a point along Dutch Creek prior to its death about 70 days post-release. The last adult female moved 1.0 km east to a clear-cut in Dutch Creek. It survived to breeding season 1990 and was found on a nest with 8 eggs. The nest was found empty on 3 June, at which time the female was flushed about 100 m from the nest with no sign of a brood. Snake predation is suspected. All other radio-collared birds were either lost or found dead in or around 11-17 year old clear-cuts.

There was no significant difference in dispersal distance between sexes (4.05 km for males, 3.6 km for females). The average move for those dispersing was 3.83 km with no apparent trend in direction. Only 38% of the radio-collared juveniles dispersed and their movements appear to be only slightly longer than the average 3 km moves recorded by Godfrey and Marshall (1969). No long distance dispersal was documented. The birds usually remained in the clear-cuts in which they were released or moved to adjacent ones. Most juvenile birds were found in 2-17 year old clear-cuts, all with relatively high stem densities.

Southern Illinois grouse appear to show habitat preferences similar to those described in other areas of the Central Hardwood Forest (Gudlin and Dimmick 1984, Thompson and Fritzell 1988). Furthermore, juvenile grouse in southern Illinois and those in established populations tend to behave

similarly during fall dispersal. However, adult female grouse tend to disperse when transplanted, which may relate to high mortality following a release.

JOB C. Spring Drumming Counts

Objective: To determine the suitability of spring drumming counts to monitor population status and distribution in Illinois.

INTRODUCTION

Male ruffed grouse use drumming to advertise their presence and location to females. Performing from a drumming stage, often a log, the male braces itself with a partially spread tail and beats its wings. Air rushing into the resulting vacuum produces a low frequency booming sound which carries well through the forest. Analysis of drumming in Ontario and West Virginia indicated that the drumming length ranges from 9.06 to 10.62 seconds, with 45.5 to 49 wingbeats (McBurney 1989).

Through studies on drumming behavior, Petraborg et al. (1953) developed a method to calculate drumming male populations in Minnesota. They calculated the average interval between drumming episodes as about 4 minutes and the average radius of audibility for a drumming male as 0.2 km. Drumming began at 4 am, peaked between 5 and 6 am, leveled to a plateau between 5 and 10 am, and fell to zero after 11 am. Drumming resumed at 4 pm, peaked at 5 pm, leveled out between 5 and 8 pm, and fell to zero after 8 pm. The drumming population was estimated by driving established drumming routes in the early spring. Personnel started about 30 min. before sunrise, stopping at 1.6 km intervals and recording drummings heard during a 4 min. time period. The average number of drummings per stop was used to calculate the number of drumming males per unit area.

Drumming count results were compared to those of winter flush counts in Wisconsin by Dorney et al. (1958). They found a strong correlation ($r = 0.96$) between estimated population sizes using each technique. They concluded that drumming counts were an efficient technique for estimating population sizes.

Drumming counts are no longer used as a direct census, but instead as an index to regional trends in breeding populations (Rodgers 1981). They are beneficial because they cover all types of habitat and allow comparison of relative grouse densities by regions or smaller areas (Ammann and Ryel 1963). However, in order to get a meaningful index from year to year the techniques and personnel used should be as consistent as possible. Drumming counts conducted in areas of heterogenous habitat should start at the same point each year to avoid sampling the best habitat during peak hours one year and during lower level times the next. Also, personnel should start their routes at the end with the highest potential for noise from human activity because the noise will be lowest during early morning hours (Rodgers 1981). Personnel shifts should also be limited to avoid differences in hearing ability which may produce records that are not comparable (Ammann and Ryel 1963).

Many other factors must be considered when evaluating drumming counts. Environmental factors such as rain, thunderstorms, and cloudy misty weather all lower or curb drumming and wind cuts down on the radius of audibility. Therefore, the drumming routes should be run on clear, still mornings (Petraborg et al. 1953). Topography can also cause substantial differences in the radius of audibility at individual listening stations (Rodgers 1981).

An important point to consider is that not all males drum. The size of the non-drumming segment is an important consideration when dealing with ruffed grouse densities, since due to an assumed 1:1 sex ratio, each male (both drumming and non-drumming) appears to represent a female in the breeding population. In Minnesota the non-drumming component was found to be lowest when the overall population was lowest and highest when the population was highest. Apparently non-drummers choose to wait for better quality habitats (10-12 year old clear-cuts in Minnesota) before drumming (Gullion 1981).

METHODS

Each spring at the beginning of April the Illinois Department of Conservation conducted annual spring drumming surveys along 12 survey routes

on 2 separate days (Figure 6). Concurrently, male grouse radio-collared the previous fall were located to determine if they were drumming and if they were heard on the survey routes.

RESULTS AND DISCUSSION

Radio-collars were placed on 5 adult males during the fall 1987 in an attempt to locate drumming areas. Three of these were located in the spring 1988. The annual drumming survey routes were conducted 5 April and 7 April, but they failed to detect the 3 radio-collared males. Five additional drumming males were detected on 9 drumming routes (Table 5). An additional non-drumming grouse was flushed on Route 4.

During the 1989 drumming surveys, conducted 5 April and 7 April, 10 drumming grouse were located, including the only surviving radio-collared male (#427). The route locations of drumming grouse are not available.

Drumming routes were run on 3 April and 5 April in 1990. A total of 10 drumming males were recorded (Table 5). An additional 2 non-drumming grouse were flushed on Route 7 and 1 on Route 1. There were no surviving radio-collared males available during this period to determine the suitability of drumming routes in locating drumming males.

Although the drumming routes seem ineffective in locating all drumming grouse, there does seem to be a correlation between the spring drumming survey and the trapping success the following fall. During the 1987 drumming survey 12 drumming grouse were heard. Thirty-two grouse were captured during the 1987 fall trapping season. In 1988, only 3 males were located in the spring drumming survey and only 3 grouse were captured during the trapping period. During 1989 there was over a 3-fold increase in both drumming males and fall captures. The drumming counts seem to be a relatively reliable predictor of the trapping success which can be expected the following fall.

JOB D. Analysis and Report

Objective: To integrate published data and findings from these studies into management recommendations based on the best available biological data.

Table 5. Data from ruffed grouse drumming routes, Union County Illinois, April 1988-90.

	YEAR		
ROUTE*	1988	1989	1990
1	0	?	2
3	0	?	0
4	2	?	2
5	1	?	0
7	2	?	2
8	0	?	0
10	0	?	1
11	0	?	1
12	0	?	2
TOTALS	5	10	10

*See Figure 6 for drumming route locations.

This objective has been met through annual reporting of findings, submission of job final reports, and annual presentations of findings to Illinois Department of Conservation staff. Original data and copies of Quarterly and Annual Federal Aid Performance Reports are on file at the Cooperative Wildlife Research Laboratory, Southern Illinois University at Carbondale, Carbondale, IL 62901.

SUMMARY

1. Trapping success was 1 bird/29.9 trap days (958 total trap days) in 1987; 1 bird/229.7 trap days (689 total trap days) in 1988; and 1 bird/32.5 trap days (325 total trap days) in 1989. Trapping success varied significantly (P=.0001) between 1988 and the remaining 2 trapping seasons. Juvenile/adult ratios of 0.5, 0.0, and 2.0 in 1987-89, respectively, did not vary significantly (P>.05).
2. Dispersal was documented in 38% of radio-collared juveniles. Males moved 4.05 km on average, while females moved an average of 3.83 km. Most birds were found in association with 2-17 year old clear-cuts.
3. Drumming routes located 3 drumming males in 1988, 10 in 1989, and 10 in 1990. Drumming counts are ineffective in locating all radio-collared drumming males, but appear to be reliable predictors of trapping success the following fall.

RECOMMENDATIONS

1. Continue limited fall trapping (approximately 10-15 traps) in clear-cuts to monitor population size and age structure in order to determine the success of previous release efforts and make further management decisions, including the need and feasibility of future releases.
2. Provide 2-20 year old areas of disturbance (i.e. clear-cuts) throughout the release area to provide optimal habitat for ruffed grouse.
3. Continue operation of spring drumming routes as a relative index of population size and an indication of optimal trapping areas.

LITERATURE CITED

Aldrich, J. W. 1963. Geographic orientation of American Tetraonidae. J. Wildl. Manage. 27:528-545.

Ammann, G. A. and L. A. Ryel. 1963. Extensive methods of inventorying ruffed grouse in Michigan. J. Wildl. Manage. 27:617-633.

Backs, S. E. 1984. Ruffed grouse restoration in Indiana. Pages 37-58 in W. L. Robinson, ed. Ruffed grouse management: State of the art in the early 1980's. North Central Section, The Wildlife Society.

Braun, E. L. 1950. Deciduous forest of eastern North America. Reprint. Hafner Publishing Company, New York, 1964. 596pp.

Bump, G. R., W. Darrow, F. C. Edminster, and W. F. Crissey. 1947. Ruffed grouse: life history, propagation, management. New York Conser. Dept., Albany. 915pp.

Chambers, R. E. and W. M. Sharp. 1958. Movement and dispersal within a population of ruffed grouse. J. Wildl. Manage. 22:231-239.

Dorney, R. S., D. R. Thompson, J. B. Hale, and F. Wendt. 1958. An evaluation of ruffed grouse drumming counts. J. Wildl. Manage. 22:35-40.

Fralish, J. S. 1988. Predicting potential stand composition from site characteristics in the Shawnee Hills Forest of Illinois. American Midland Naturalist. 120(1):79-101.

Godfrey, G. A. and W. H. Marshall. 1969. Brood break-up and dispersal of ruffed grouse. J. Wildl. Manage. 33:609-620.

Gudlin, M. J. and R. W. Dimmick. 1984. Habitat utilization by ruffed grouse transplanted from Wisconsin to west Tennessee. Pages 75-88 in W. L. Robinson, ed. Ruffed grouse management: State of the art in the early 1980's. North Central Section, The Wildlife Society.

Gullion, G. W. 1981. Non-drumming males in a ruffed grouse population. Wilson Bull. 93:372-382.

Hale, J. B. and R. S. Dorney. 1963. Seasonal movements of ruffed grouse in Wisconsin. J. Wildl. Manage. 27:648-656.

Johnsgard, P. A., R. O. Kimmel, S. J. Maxson, J. G. Scott, R. Small, and G. L. Storm. 1989. The young grouse. Pages 140-159 in S. Atwater and J. Schnell, eds. Ruffed grouse. Stackpole Books, Harrisburg, PA. 370pp.

Kurzejeski, E. W. and B. G. Root. 1988. Survival of reintroduced ruffed grouse in north Missouri. J. Wildl. Manage. 52:248-252.

Lewis, J. B., J. D. McGowan, and T. S. Baskett. 1968. Evaluating ruffed grouse reintroduction in Missouri. J. Wildl. Manage. 32:17-28.

McBurney, R. S. 1989. Drumming. Pages 176-197 in S. Atwater and J. Schnell, eds. Ruffed grouse. Stackpole Books, Harrisburg, PA. 370pp.

Miles, C. C., J. W. Scott, B. E. Currie, and L. A. Dungan. 1976. Soil survey of Union County, Illinois. U.S. Dept. of Agr., S.C.S. and Forest Service in cooperation with Illinois Agr. Exp. Station. 162pp.

Norris, R. W. 1986. Evaluation of a ruffed grouse reintroduction in southern Illinois. M.S. Thesis. Southern Illinois Univ., Carbondale. 60pp. Unpubl.

Petraborg, W. H., E. G. Wellein, and V. E. Gunvalson. 1953. Roadside drumming counts: a spring census method for ruffed grouse. J. Wildl. Manage. 17:292-295.

Rodgers, R. D. 1981. Factors affecting ruffed grouse drumming counts in southwestern Wisconsin. J. Wildl. Manage. 45:409-418.

Thompson, F. R. and E. K. Fritzell. 1988. Ruffed grouse winter roost site preference and influence on energy demands. J. Wildl. Manage. 53:15-21.

U.S. Forest Service. 1986. Final environmental impact statement for the land and resource management plan, Shawnee National Forest. U.S. Government Printing Office. 314pp.

Voigt, J. W. and R. H. Mohlenbrock. 1964. Plant communities of southern Illinois. Southern Illinois Univ. Press, Carbondale. 202pp.

Woolf, A., R. E. Norris, and J. H. Kube. 1984. Evaluation of ruffed grouse reintroductions in southern Illinois. Pages 59-74 in W. L. Robinson, ed. Ruffed grouse management: State of the art in the early 1980's. North Central Section, The Wildlife Society.

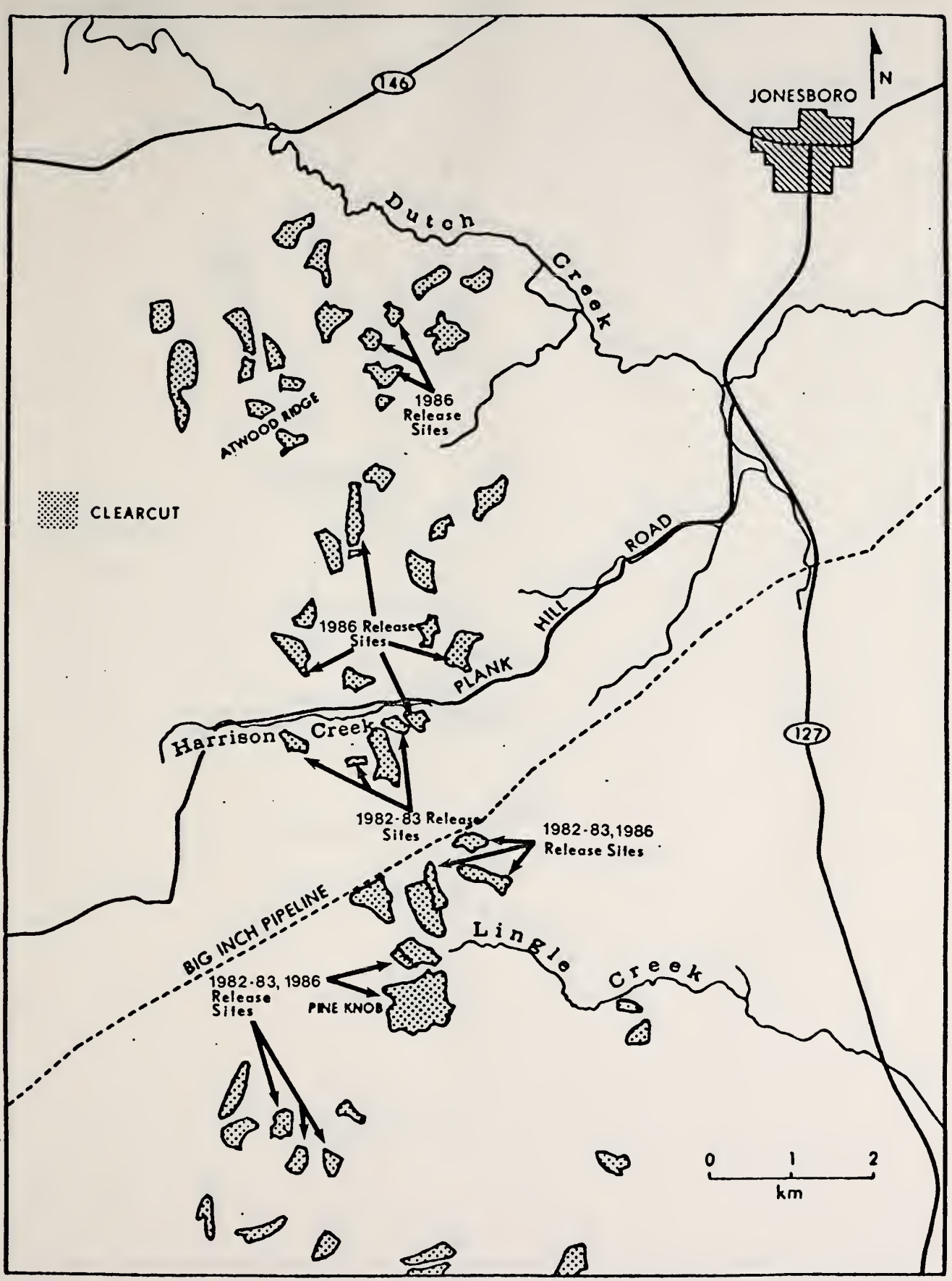


Figure 1. Ruffed grouse release sites, 1982, 1983, 1986, Union County, Illinois.

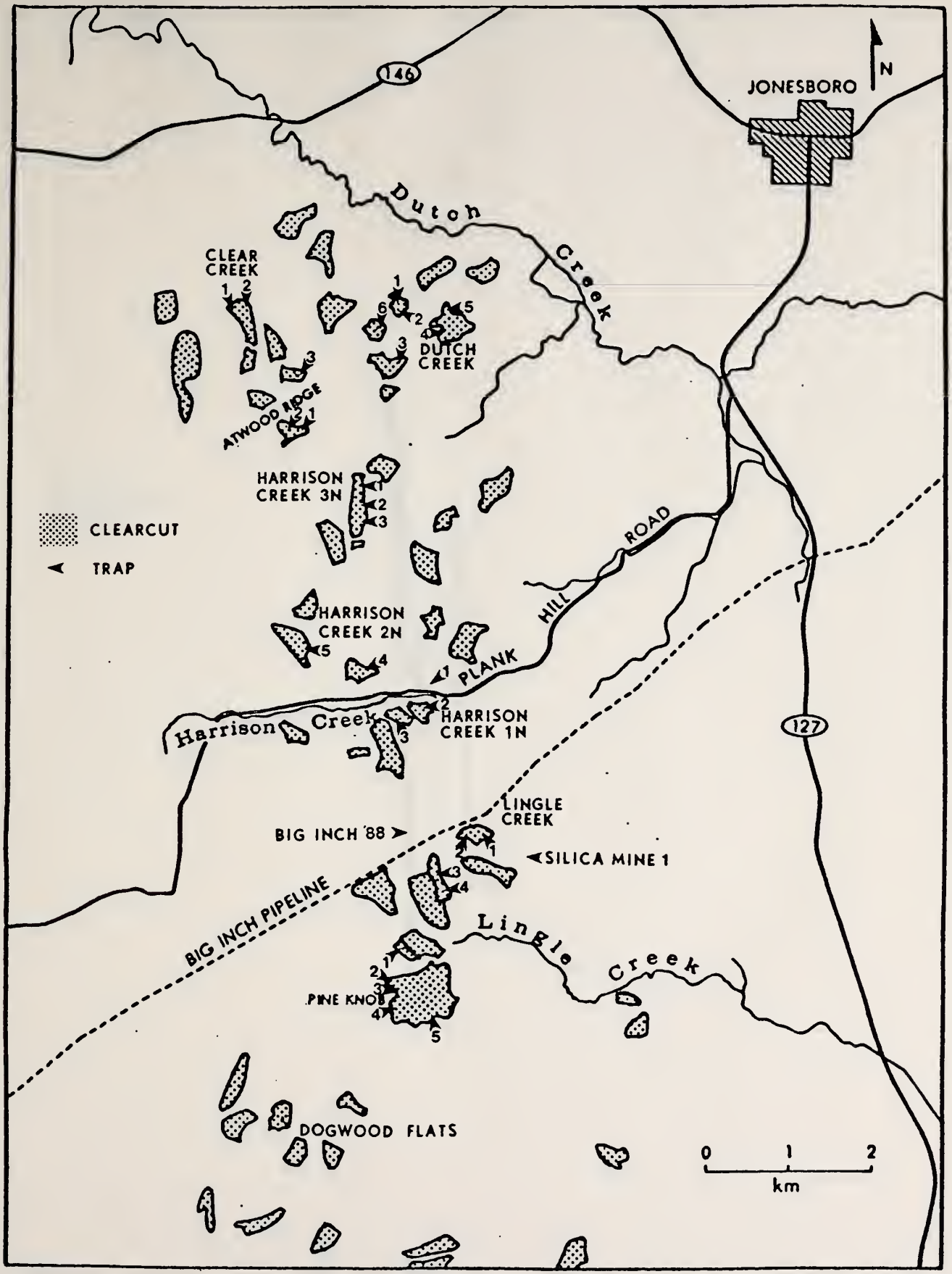


Figure 2. Ruffed grouse trap sites, Union County, Illinois, Fall 1987-1989.

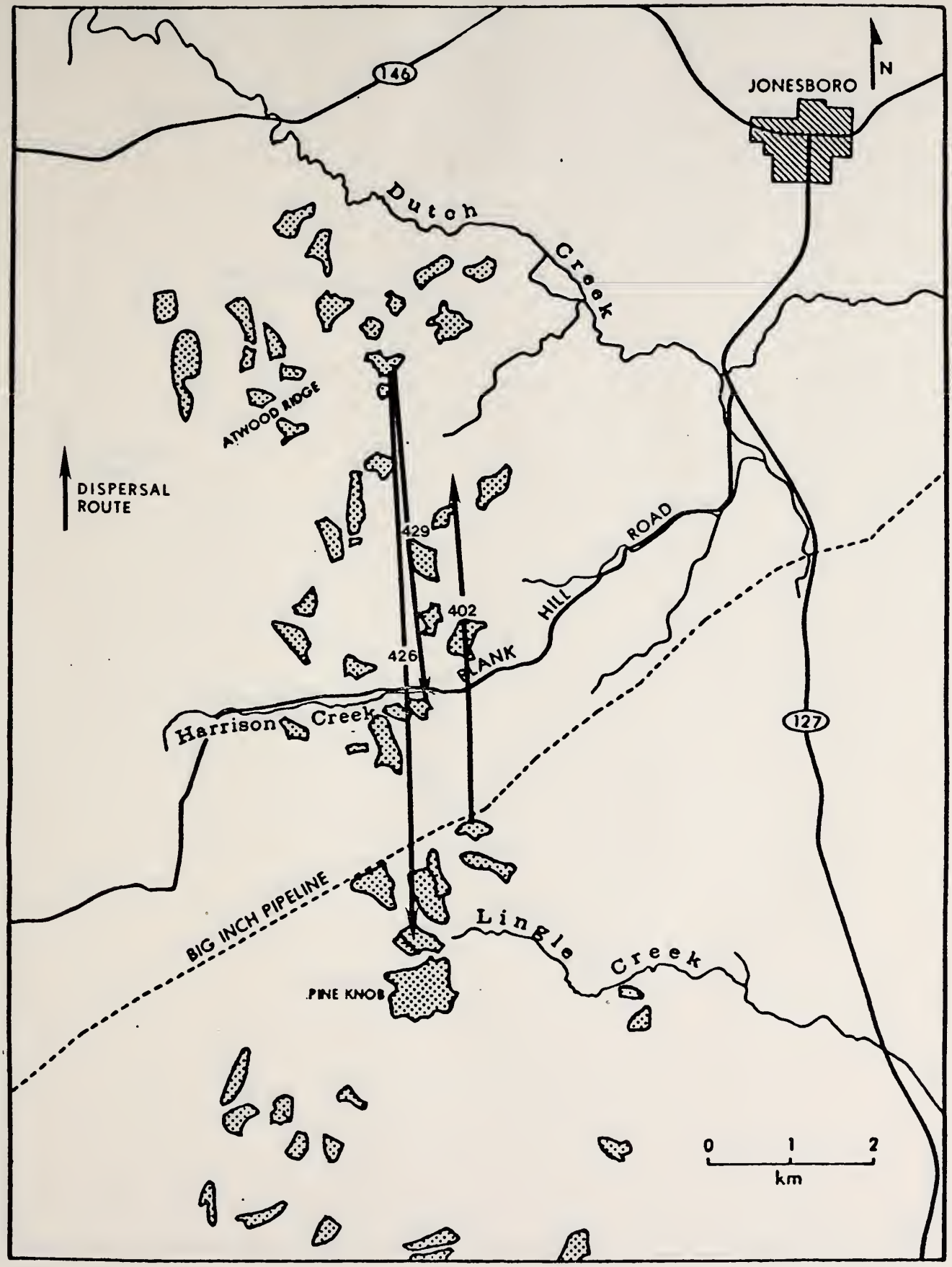


Figure 3. Dispersal routes of juvenile ruffed grouse, Union County, Illinois, Fall 1987.

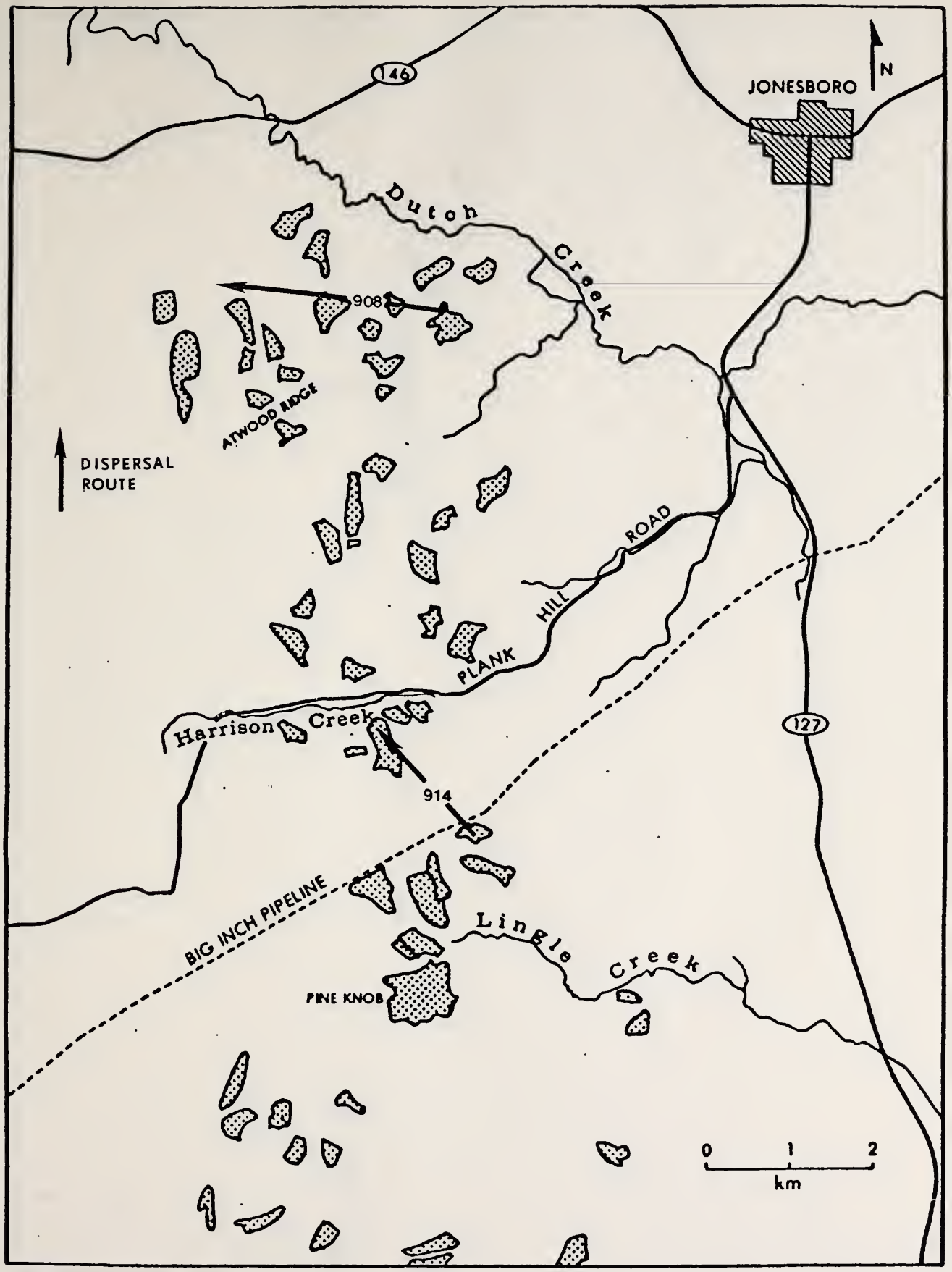


Figure 4. Dispersal routes of juvenile ruffed grouse, Union County, Illinois, Fall 1989.

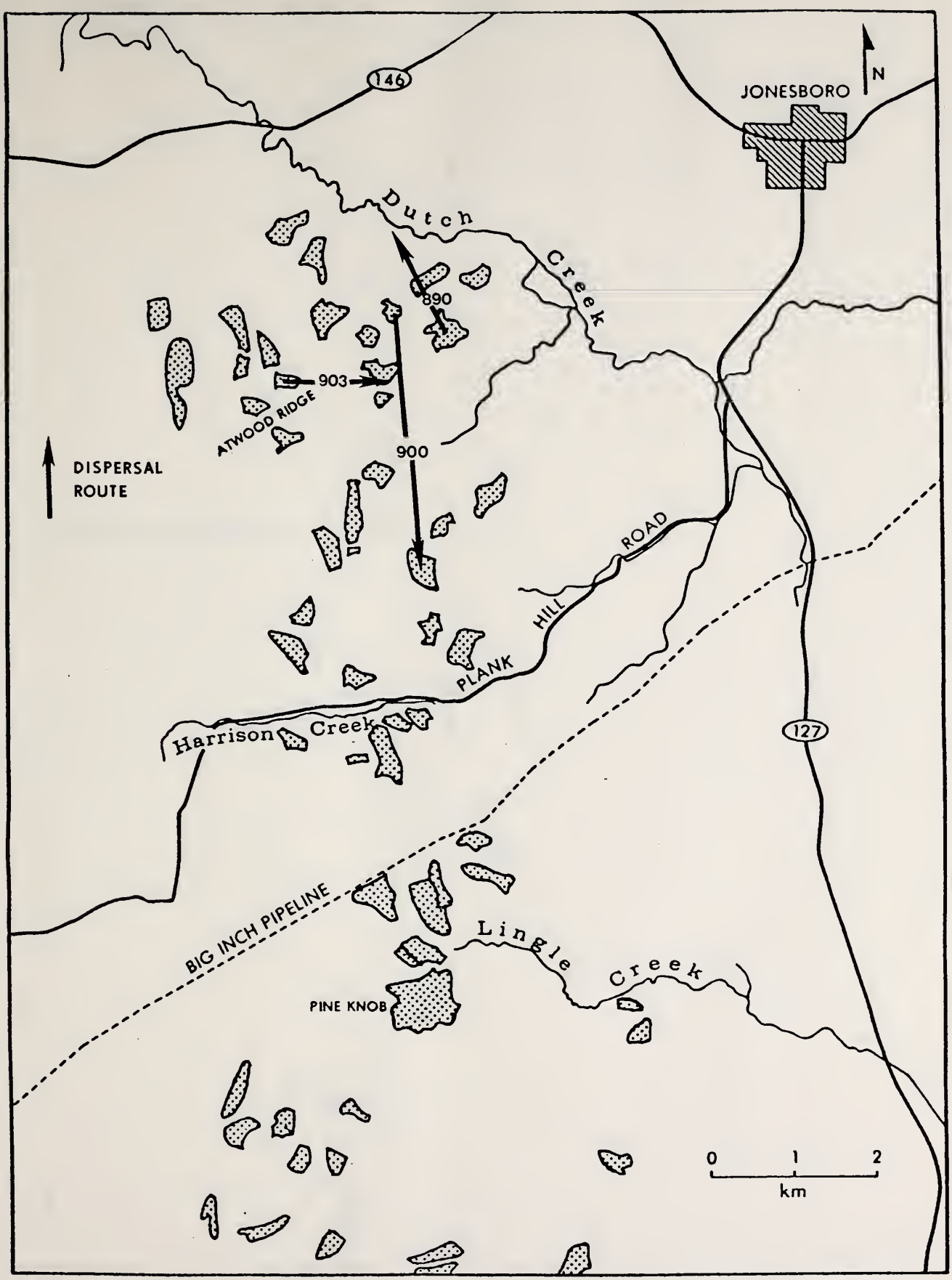


Figure 5. Dispersal routes of Minnesota grouse released in Union County, Illinois, 10 September, 1989.

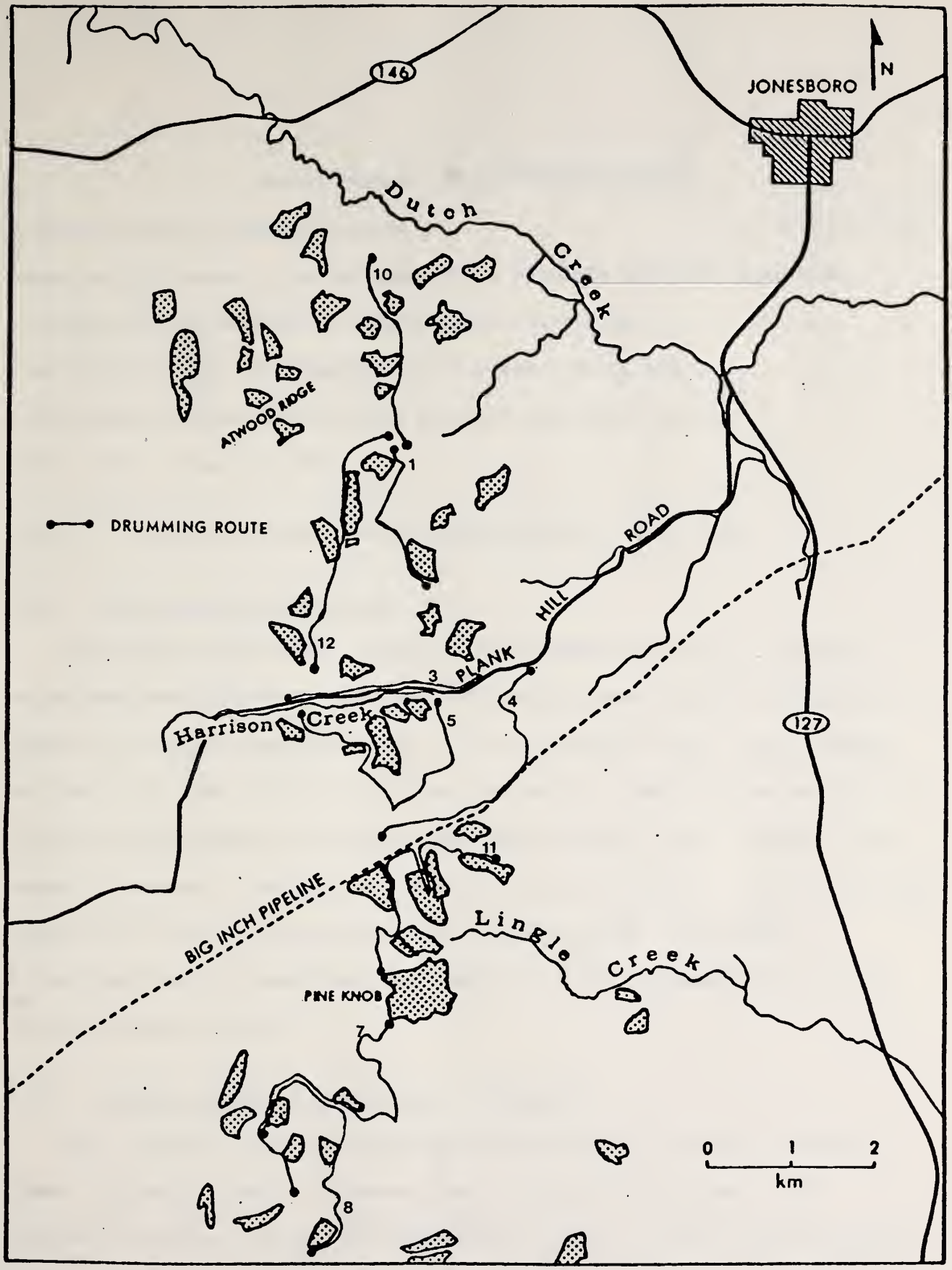


Figure 6. Spring drumming census routes, Union County, Illinois.

ANNUAL FEDERAL AID PERFORMANCE REPORT

Illinois Forest Game Investigation W-63-R(SI)-31

Department of Conservation and Cooperative Wildlife Research Laboratory,

Southern Illinois University - Carbondale Cooperating

Alan Woolf, Cooperative Wildlife Research Laboratory, SIU-C

Peter Sharpe, Cooperative Wildlife Research Laboratory, SIU-C

July 1, 1988 - June 30, 1989

STUDY VII. STATUS OF RUFFED GROUSE REINTRODUCTIONS IN ILLINOIS.

Job A. Fall Juvenile/Adult Ratios

Twenty-four clover-leaf traps were established beginning 12 September within and around the 1982, 1983 and 1986 release areas (Figs. 1 and 2). The number of traps was reduced from 24 to 16 on 7 October (Fig. 3) by removing the tops of 8 traps. Three adult grouse (2 males, 1 female) were captured in 689 trap nights ending 16 October. Each bird was sexed, aged, weighed, leg banded if necessary, and released at the trap site (Table 1). One of the 1988 captures was a recapture from previous trapping seasons (Band #427). Recruitment into the population was demonstrated by 2 unbanded adult grouse captured (Bands #826, 827).

Job B. Juvenile Dispersal and Habitat Utilization

Poor trapping success in fall 1988 precluded radio-marking an adequate number of birds to monitor dispersal and/or habitat utilization. We hypothesize productivity of reintroduced grouse may be constrained by limited energy and protein reserves prior to egg laying and incubation. Therefore, plans were modified to focus on habitat use with emphasis on availability of winter/spring diets and foraging efficiency.

Staff of the Minnesota Dept. Nat. Res., Division of Fish and Wildlife agreed to collaborate in this research effort by providing permits and facilities to collect up to 100 eggs in spring 1989 and up to 80 birds in fall 1989. A permit was issued to collect ruffed grouse and their eggs in the SE Minnesota counties of Fillmore, Houston, Olmstead, Wabasha, and Winona.

Jon Cole, Manager of the Whitewater Wildlife Management Area, provided essential help by arranging to publicize need to locate grouse nests and advertised for temporary contract workers. He also provided logistic support at the Whitewater site. Laboratory staff searched for grouse nests from 17 April through 25 May 1989; a total of 5 nests were found containing 63 eggs; 59 (93.7%) were fertile (Table 2). Clutch size ranged from 10 to 17 eggs (x = 12.6 eggs). A total of three eggs from three separate clutches had been cracked, apparently by the females' nails when they flushed suddenly from the nest. These eggs were treated with nail polish and one successfully hatched. In addition, a brood of 7 chicks about one day old was captured on 25 May and transported to Southern Illinois University.

Of the 59 fertile eggs, 36 (61%) successfully hatched. Two chicks died at low body weights within a week of hatching, apparently from failure to recover from the stress of hatching. At the time of writing (20 June), 34 chicks hatched from eggs are alive, ranging in age from 1-25 days. Chicks are growing well and apparently thriving on a diet of mealworms, Purina Gamebird Startena, and water supplemented with vitamins and electrolytes. During the day, chicks are given the run of a small room in the Vivarium where they are under constant supervision. At night they are kept in a battery brooder in the Vivarium. The chicks are tame and have imprinted nicely on the graduate student providing most of the care. No disease problems are apparent and most chicks will be ready to be moved to outdoor pens within 2-3 weeks.

Of the brood of 7 chicks that were captured in the wild, 1 died in transport and 2 more died within a few hours of reaching Southern Illinois University, apparently from the stress of the trip. A fourth chick in the captured brood failed to gain weight and died several days after the trip. The remaining 3 chicks are still alive and developing normally. We currently have a total of 37 ruffed grouse chicks.

Efforts to imprint chicks are currently underway. A subsample of these birds and others to be captured in fall 1989 will be released on the southern Illinois grouse restoration study area in the fall to closely monitor food selection and habitat use. Concurrently, field studies will be conducted to determine availability of known and potential winter/spring food items. Available energy will be related to energetic needs to predict site suitability to meet energetic requirements for optimum productivity.

Job C. Spring Drumming Counts

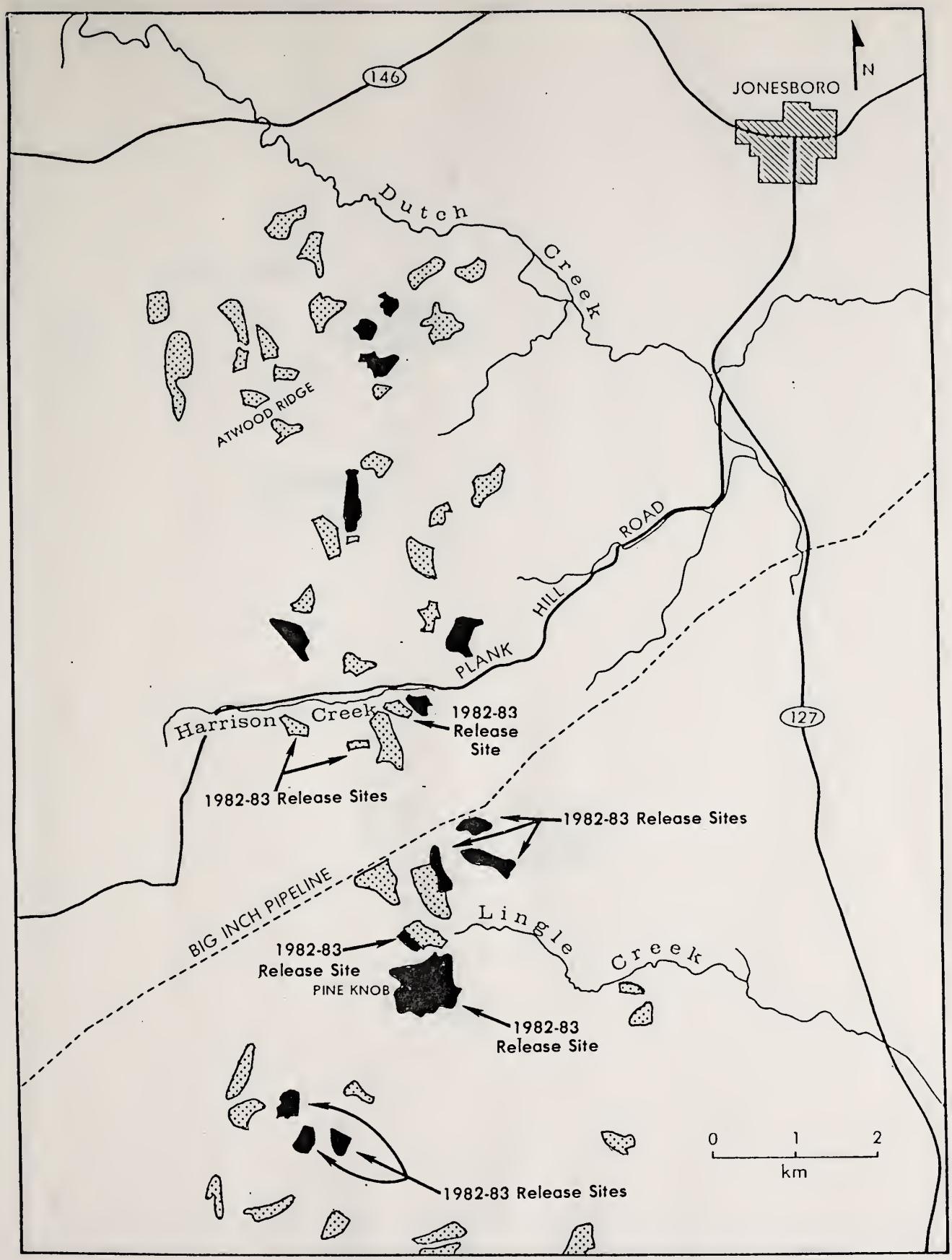
Poncho-mounted radio transmitters were placed on the two males captured to locate drumming areas and to determine if these males were heard during planned drumming surveys. One male (#827) was found dead on 14 November and the transmitter was recovered. The annual drumming survey routes were conducted 5 April through 7 April. A total of 10 grouse were heard, including the remaining radio-collared bird (#427).

Table 1. Summary of grouse trapping data, 1988.

AGE	SEX	WEIGHT	TRAPDATE	LOCATION	BAND#	RADIO FREQ	COMMENTS
AD	F	520 g	9/17/88	Pine Knob #3	826	-----	New Band
AD	M	580 g	9/26/88	Dutch Creek #1	427	148.301	Recapture
AD	M	590 g	10/10/88	Atwood #1	827	148.011	-----

Table 2. Hatching success of ruffed grouse eggs collected from wild clutches in southeastern Minnesota.

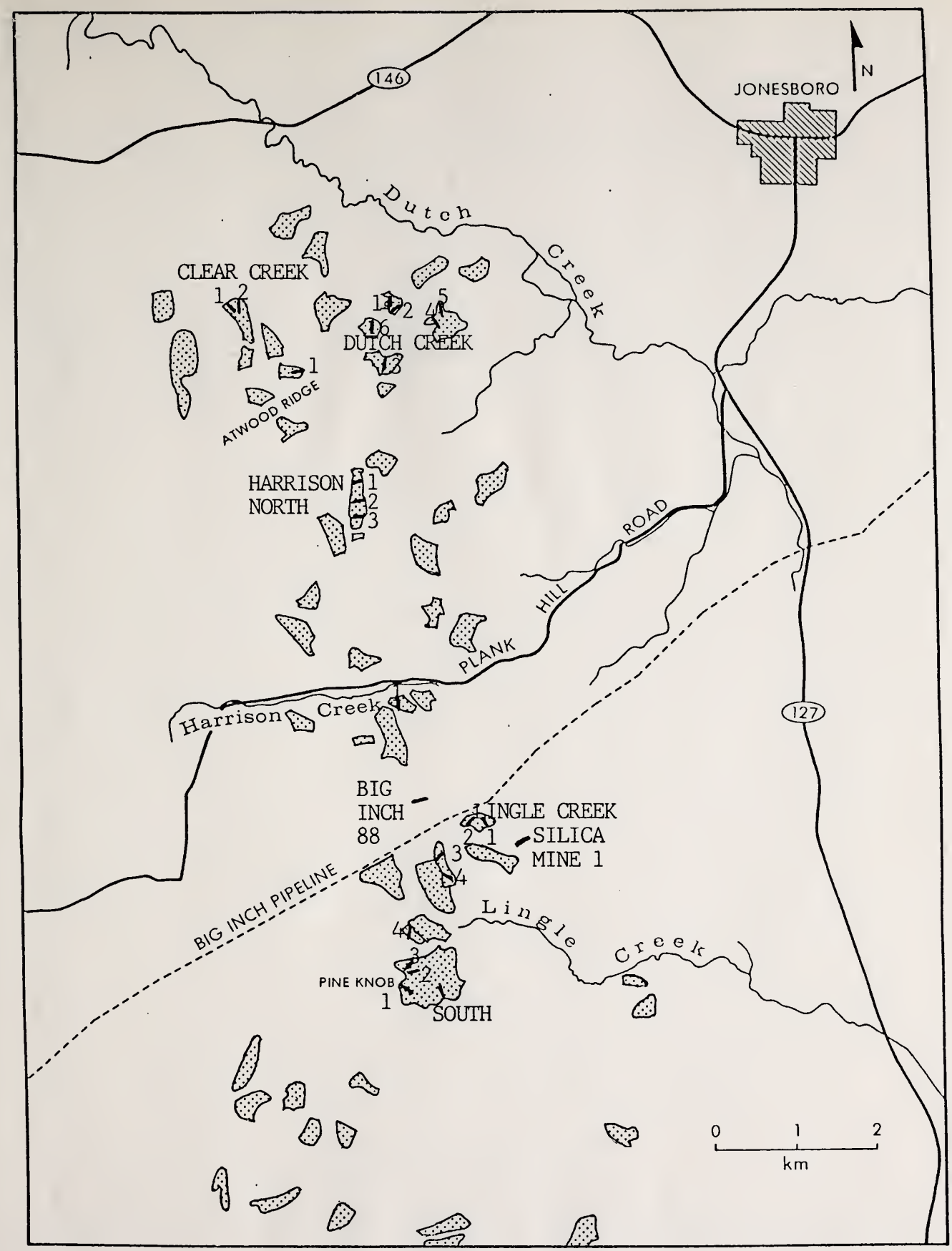
Clutch ID	Clutch Size	Fertility	Hatching Success	Chick Survival
A	11	11(100%)	6(55%)	5(83%)
B	12	9(75%)	4(44%)	4(100%)
C	17	17(100%)	8(47%)	7(88%)
D	13	12(92%)	11(92%)	11(100%)
E	10	10(100%)	7(70%)	7(100%)
TOTAL	63	59(94%)	36(61%)	34(94%)



= CLEAR-CUT

= 1986 RELEASE SITE (CLEAR-CUT)

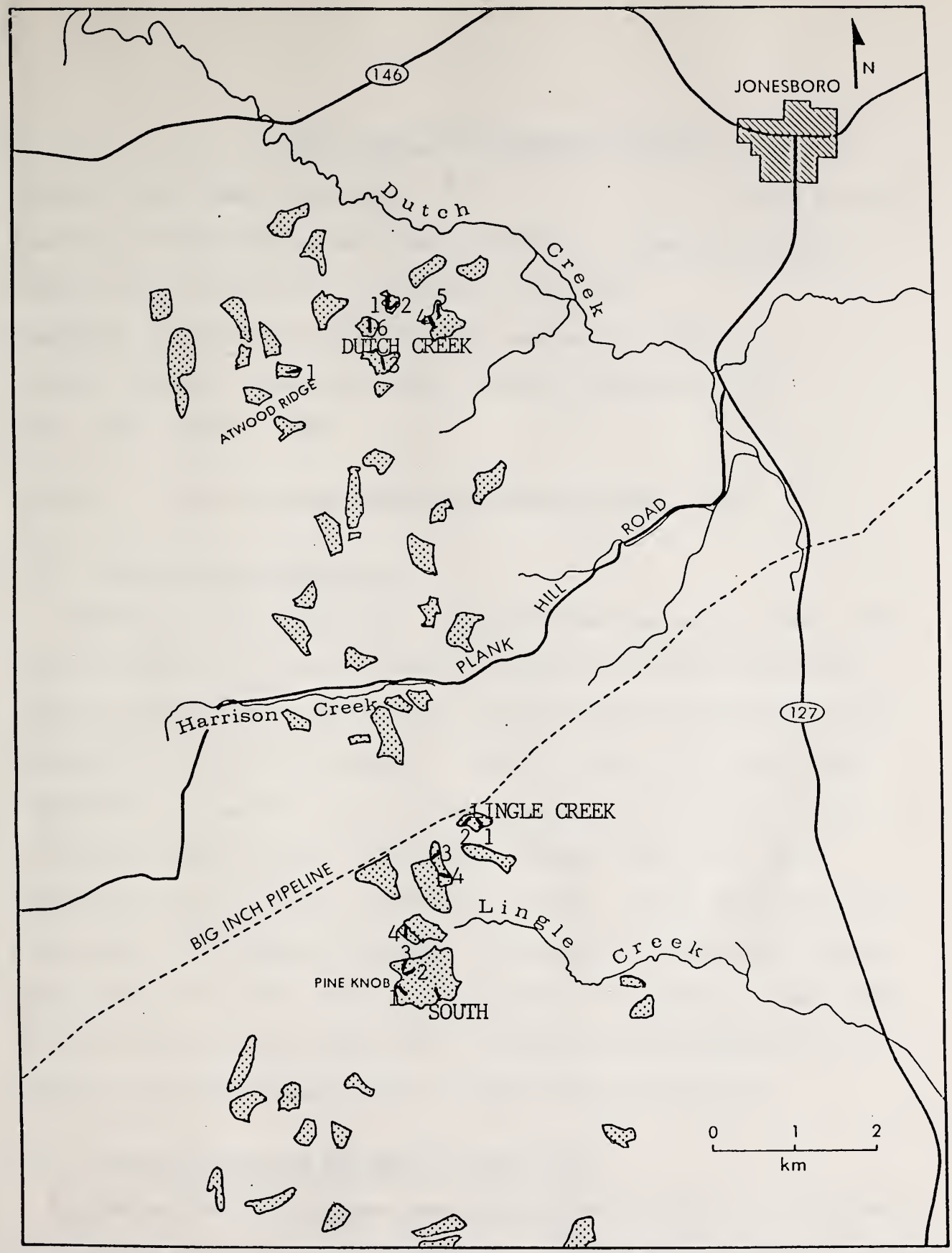
Fig. 1. Ruffed grouse release sites, 1982, 1983, and 1986, Union County, Illinois.



= CLEAR-CUT

— = TRAP SITE

Fig. 2. Ruffed grouse trap sites, Union County, Illinois, 12 August-6 October, 1988.



= CLEAR-CUT

— = TRAP SITE

Fig. 3. Ruffed grouse trap sites, Union County, Illinois, 7 October- 16 October, 1988.

ANNUAL FEDERAL AID PERFORMANCE REPORT

Illinois Forest Game Investigation W-63-R(SI)-30

Department of Conservation and Cooperative Wildlife Research Laboratory,

Southern Illinois University - Carbondale Cooperating

Alan Woolf, Cooperative Wildlife Research Laboratory, SIU-C

Milton L. Hubbard, Cooperative Wildlife Research Laboratory, SIU-C

July 1, 1987 - July 1; 1988

STUDY VII. STATUS OF RUFFED GROUSE REINTRODUCTIONS IN ILLINOIS.

Job A. Fall Juvenile/Adult Ratios

Twenty-four clover leaf traps were established beginning 25 August 1987 within and around the 1982, 1983, and the 1986 Union County release areas (Figure 1 and Figure 2). Thirty-two grouse (28 different individuals) were captured in 958 trap nights ending 16 October. Each bird was sexed, aged, weighed, and leg banded if necessary and released at the trap site (Table 1). The capture sample (18 adult and 9 juvenile grouse) represents a fall juvenile/adult ratio of only .5 juveniles/1 adult. Sixteen males (12 adults, 4 juveniles) and 12 females (6 adults, 5 juveniles, 1 unknown) were captured. Fifty percent (14) of the 1987 captures consisted of recaptures from releases in 1986 and earlier. Recruitment into the population was demonstrated as 4 unbanded adult grouse (Bands # 405, 427, 428, 431) were captured.

Job B. Juvenile Dispersal and Habitat Utilization

Poncho mounted radio transmitters (Wildlife Materials, Inc.) were placed on 8 juvenile grouse (4 male, 4 female). The mounted transmitters all weighed less than 12.6 g and the percent transmitter to body weight ranged from 1.6 - 3.0 g (Table 1). A twice weekly monitoring schedule was established to detect any dispersal from the capture sites. Sixty separate days were expended

monitoring 14 grouse (8 juveniles, 6 adults). A total of 225 approximate locations were taken, if the signal remained in the same location 2 consecutive times the bird was flushed to verify its condition. Grouse were flushed on 87 occasions with the exact flushing site recorded on 7.5 minute topographic maps.

Dispersal was documented in 3 juveniles (2 females, 1 male)(Figure 3). A juvenile male (Band #426) captured at Dutch Cr. #3, 30 Aug., dispersed to Pine Knob and was relocated 12 Dec., a linear movement of 6.4 km. A juvenile female (Band #429) also captured at Dutch Cr. #3, 22 Sept., dispersed to Harrison 1N and was relocated 12 Dec., a linear distance of 3.2 km. Dispersal was believed to occur during the second week of October as radio contact was lost with 5 of 8 radio equipped juveniles during this period. The other juvenile female (Band #402) was trapped at Big Inch #2, radio contact was lost 16 Oct., and reestablished thru aerial survey 28 Feb., 4.0 km north of the capture site. On 26 April, its transmitter was recovered from the periphery of a regenerating clearcut. No signs of predation were evident at the recovery site. Radio contact was lost on 2 other juveniles (Bands #401, 430) 16 Oct., and never reestablished. The other 3 juveniles (juv. female #406, juv. males #407, and 403) displayed minimal dispersal. One juvenile female (Band #406) nested successfully (Figure 3). The nest was discovered 20 April containing 10 eggs. Hatching occurred between 12 May and 17 May with 8 of 10 eggs successful. The nest was 0.8 km from the capture site in a mature upland hardwood stand located midslope to the ridgetop.

Fidelity of recaptured and radio equipped grouse to the core release area was demonstrated. Only 3 of 14 juvenile and adult grouse released prior to and including 1986 dispersed from their original release areas (Table 2).

Telemetry monitoring during 1987-1988 detected no significant movements by any of the 6 adult grouse from their capture sites.

Habitat selection and use by juveniles were primarily limited to clearcuts within the core area. Of the 3 juveniles which dispersed, 2 dispersed to 1 year old clearcuts consisting of sapling dogwood, sassafras, and beech with an open overstory.

Radio transmitters did not appear to adversely impact grouse survival (Table 3). Four transmitters were recovered after placement; 2 as a result of raptor predation at 3+ months and 7+ months, and 2 from unknown causes after 1 month and 7+ months, respectively.

Job C. Spring Drumming Counts

Radio transmitters were placed on 5 adult males in an attempt to locate drumming areas and to determine if these males are heard during planned drumming surveys. The transmitter packages ranged from 1.8-1.9% of body weight (Table 1). Two males were unusable due to predation or transmitter failure. The annual drumming survey routes were conducted 5 April and 7 April. Five grouse were heard on 9 drumming routes (Table 4). However, none of the 3 remaining radioed males were detected. In comparison, 12 grouse were detected in 1987 and 7 in 1986 (Table 5).

Table 1. Ruffed grouse capture data, Union County, Illinois, August - October, 1987.

AGE	SEX	TRAP DATE	LOCATION	BAND #	WEIGHT	FREQ.	RADIO WT.	% BODY WT.
AD	M	8/26/87	DUTCH CR.#3	333	ok 590 g	230	10.5 g	1.8
AD	M	8/28/87	BIG INCH #2	373	ok 580	---	----	---
AD	M	8/29/87	HARRISON 1N	377	excl 650	---	----	---
AD	F	8/29/87	HARRISON 1N	56-IL	excl 580	154	11.6	2.0
				G2812-IN				---
AD	M	9/4/87	DUTCH CR.#2	427	fair 560	379	10.5	1.9
AD	M	9/14/87	DUTCH CR.#5	302	ok 605	358	11.4	1.9
AD	M	9/16/87	PINE KNOB#2	151	ok 600	311	11.2	1.9
AD	F	9/22/87	DUTCH CR.#3	428	---	---	----	---
AD	M	9/26/87	ATWOOD #1	184	poor 560	131	10.4	1.9
AD	F	9/27/87	DUTCH CR.#5	431	poor 480	---	----	---
AD	M	9/28/87	ATWOOD #2	384	---	---	----	---
AD	F	10/1/87	DUTCH CR.#3	313	---	---	----	---
AD	M	10/2/87	LINGLE WEST#2	385	excl 645	---	----	---
AD	M	10/3/87	PINE KNOB #1	G2825	excl 690	---	----	---
AD	M	10/4/87	LINGLE WEST#4	405	---	---	----	---
AD	M	10/12/87	PINE KNOB #1	198	PREDATOR KILL IN TRAP			---
UNK	F	10/15/87	BIG INCH #2	---	"		"	---
AD	F	10/8/87	DUTCH CR. #1	352	"		"	---
AD	F	10/8/87	DUTCH CR. #3	303	"		"	---
AD	M	10/8/87	DUTCH CR. #4	302	RETRAP			---
IM	F	8/27/87	BIG INCH #2	401	poor 450	330	10.3	2.3
IM	F	8/28/87	BIG INCH #2	402	ok 520	056	11.5	2.2
IM	F	8/30/87	BIG INCH #2	402	RETRAP			---
IM	M	8/30/87	DUTCH CR.#3	426	poor 450	076	10.3	2.3
IM	F	9/22/87	DUTCH CR.#3	429	poor 415	408	12.6	3.0
IM	M	9/23/87	DUTCH CR.#4	430	poor 500	202	10.2	2.0
IM	M	9/27/87	LINGLE WEST#3	403	ok 565	230A	10.5	1.9
IM	F	10/1/87	BIG INCH #2	404	ok 500	---	----	---
IM	M	10/4/87	LINGLE WEST#3	403	RETRAP			---
IM	M	10/7/87	HARRISON 1N	407	excl 650	281	10.3	1.6
IM	F	10/5/87	HARRISON 1N	406	good 550	257	11.5	2.1
IM	M	10/12/87	LINGLE WEST#2	403	RETRAP			---

Table 2. Capture and dispersal of ruffed grouse released prior to 1986 and recaptured in 1987, Union County, Illinois.

		GROUSE RELEASED 1986 AND PRIOR		
AGE	SEX	BAND	RELEASE SITE/YEAR	1987 CAPTURE SITE
AD	M	333	DUTCH CR./86	DUTCH CR.
AD	M	373	BIG INCH C.C./86	BIG INCH C.C
IM	M	377	HARRISON 1 N/86	HARRISON 1 N
IM	F	G2812	DOGWOOD FLATS/82	HARRISON 1 N
		IL-56		
AD	M	302	DUTCH CR./86	DUTCH CR.
AD	M	151	PINE KNOB SOUTH/86	PINE KNOB SOUTH
IM	M	184	DUTCH CR./86	ATWOOD RIDGE #1
AD	M	384	HARRISON 3 N/86	ATWOOD RIDGE #2
IM	F	313	DUTCH CR./86	DUTCH CR.
AD	M	385	LINGLE CR. WEST/86	LINGLE CR. WEST
IM	M	G2825	PINE KNOB SOUTH/86	PINE KNOB SOUTH
AD	M	198	PINE KNOB SOUTH/82	PINE KNOB SOUTH
AD	F	352	DUTCH CR./86	DUTCH CR.
AD	F	303	DUTCH CR./86	DUTCH CR.

Table 3. Fate of ruffed grouse equipped with radio transmitters, Union County release sites, August, 1987 - May, 1988.

Radio freq.	Age/Sex	Date installed	Date recovered	Fate
148.131	Ad./M	9/26/87	1/15/88	Raptor predation
148.230	Ad./M	8/26/87	9/25/87	Unknown
148.056	Juv./M	8/28/87	4/26/88	Unknown
148.358	Ad./M	9/14/87	4/4/88	Raptor predation
148.230A	Juv./M	9/27/87	1/15/88	Radio failure
148.330	Juv./M	8/27/87	Never relocated	
148.076	Juv./M	8/30/87	3/5/88	Signal lost
148.311	Ad./M	9/16/87	3/15/88	Signal lost
148.408	Juv./F	9/22/87	3/15/88	Signal lost
148.202	Juv./M	9/23/87	Never relocated	
148.154	Ad./F	8/29/87	5/17/87	Radio working
148.257	Juv./F	10/5/87	5/17/87	Radio working
148.281	Juv./M	10/7/87	5/10/88	Signal lost
148.379	Ad./M	9/4/87	5/17/87	Radio working

Table 4. Drumming activity from 9 ruffed grouse census routes, Union County, Illinois, April, 1988.

Date/Route	1	3	4	5	7	8	10	11	12	Total
April 5	0	0	2	1	0	0	0	0	0	3
April 7	0	0	0	0	2	0	0	0	0	2

Table 5. Number of ruffed grouse heard drumming from 11 census routes, Union County, Illinois, April, 1983-1988.

Route/Year	1983	1984	1985	1986	1987	1988
1	0	1	2	1	1	0
2	0	0	0	0	--	--
3	0	2	0	0	1	0
4	0	1	0	0	0	2
5	1	1	1	1	--	1
6	1	1	0	0	1	--
7	1	0	0	2	3	2
8	0	0	--	1	0	0
9	--	1	3	2	4	--
10	--	3	--	--	2	0
11	--	--	--	--	0	0
Totals	3	10	6	7	12	5

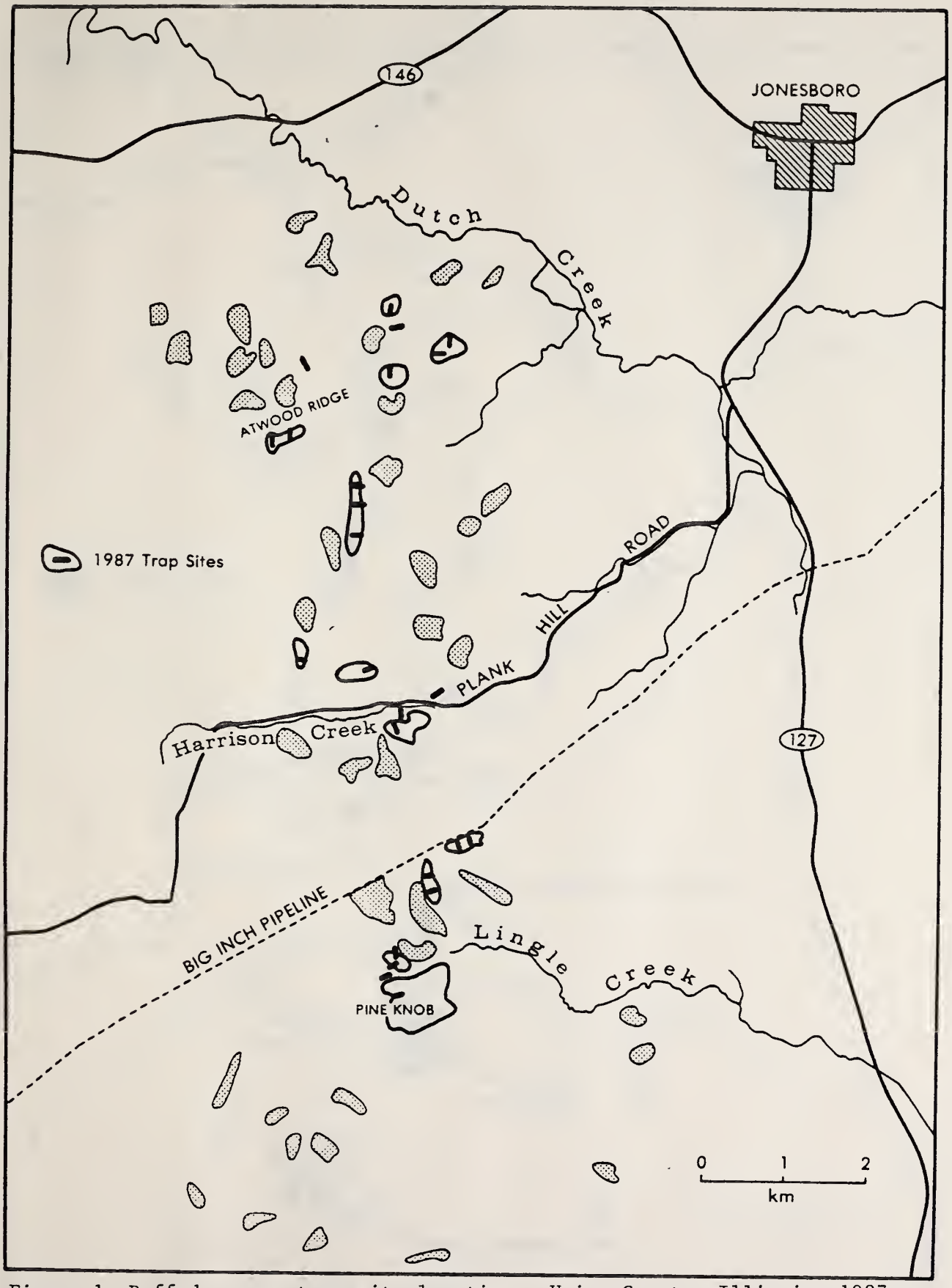


Figure 1. Ruffed grouse trap site locations, Union County, Illinois, 1987. All sites were located in or adjacent to clearcuts of various ages.

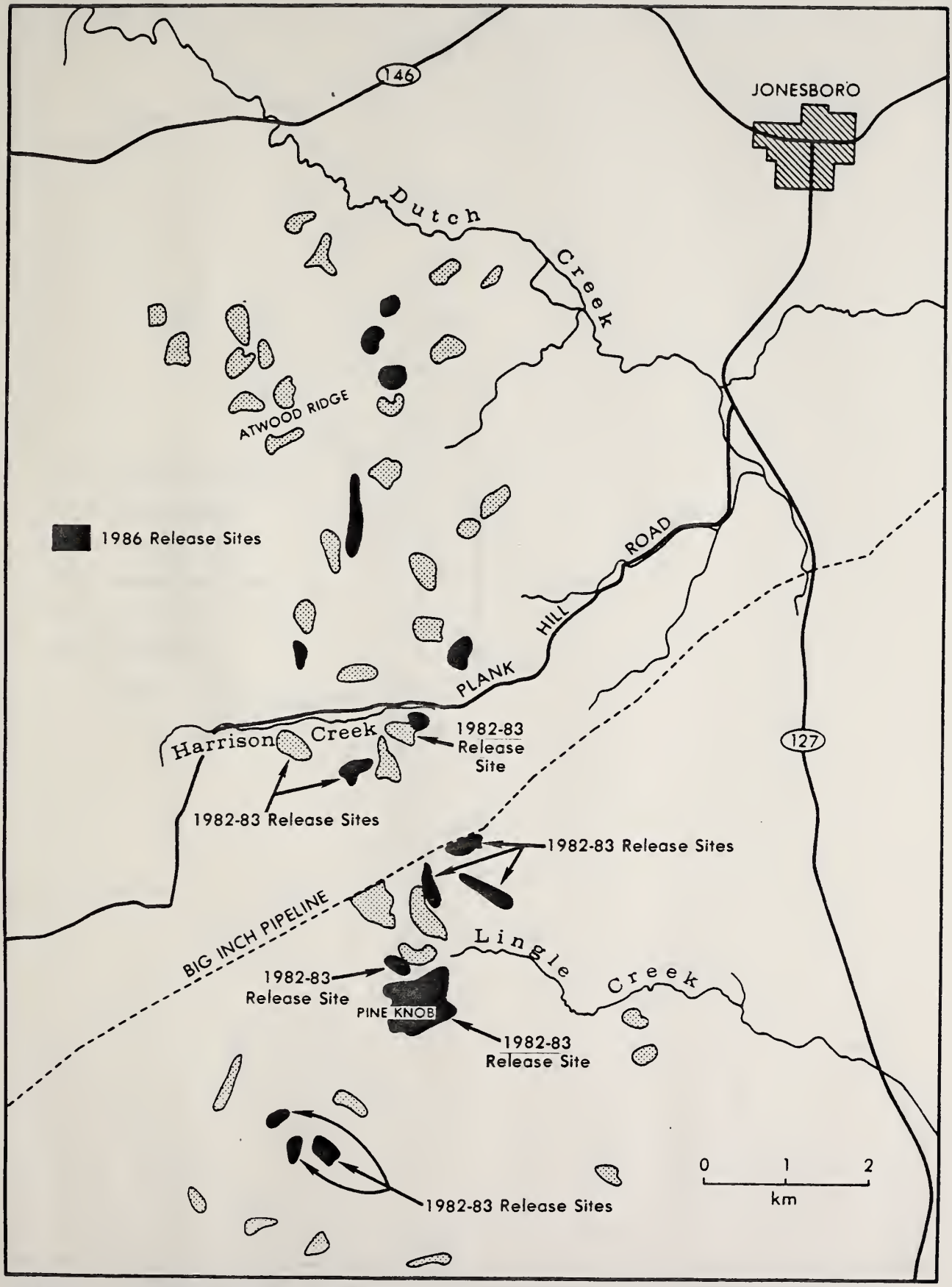


Figure 2. Ruffed grouse release sites, 1982, 1983, and 1986, Union County, Illinois. All sites were located in clearcuts of various ages.

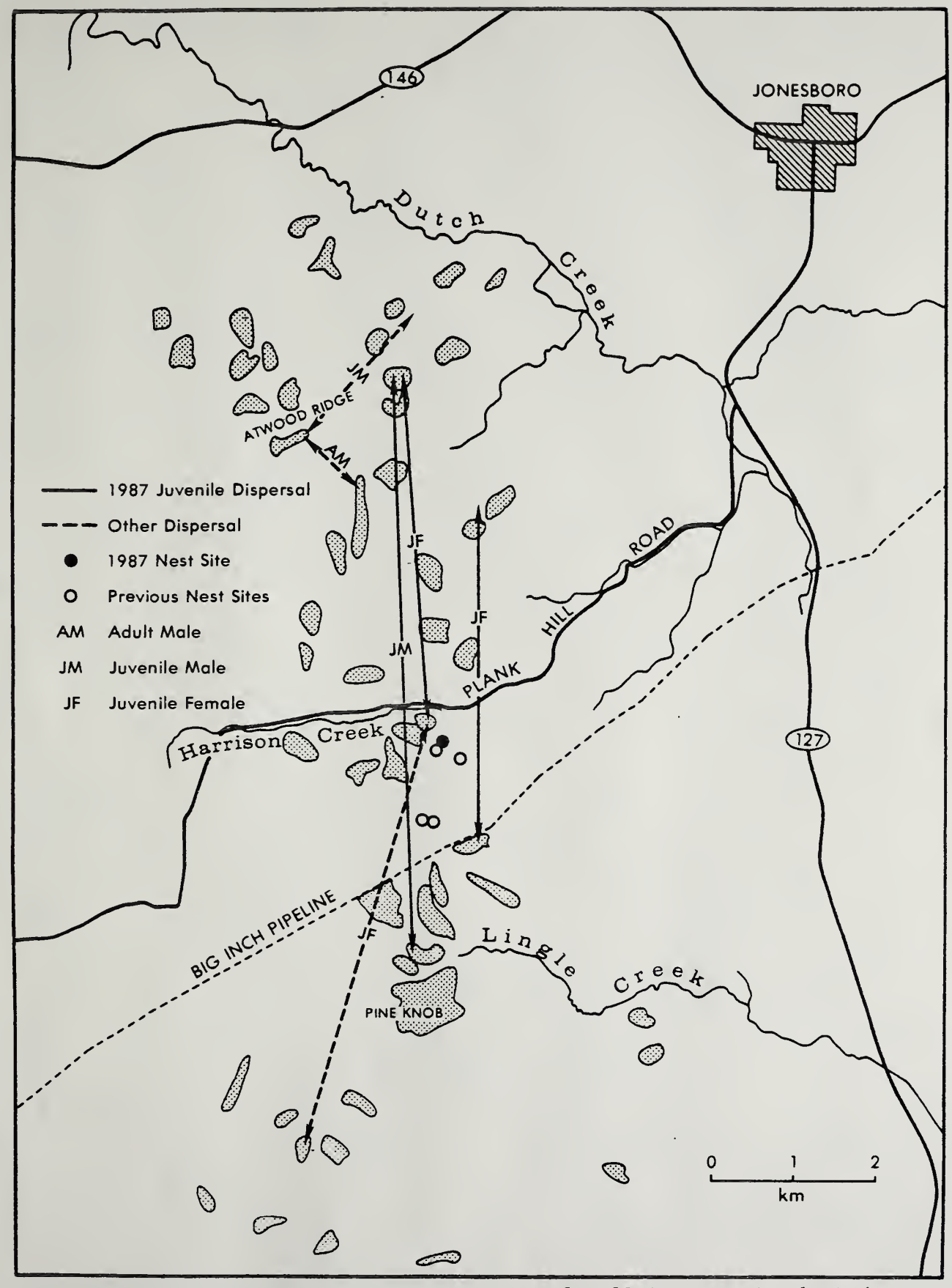


Figure 3. Dispersal and nest site locations of ruffed grouse in the Union County study areas.

QUARTERLY FEDERAL AID PERFORMANCE REPORT

Illinois Forest Game Investigation W-63-R(SI)-30

Department of Conservation and Cooperative Wildlife Research Laboratory,
Southern Illinois University - Carbondale Cooperating
Alan Woolf, Cooperative Wildlife Research Laboratory, SIU-C
Milton L. Hubbard, Cooperative Wildlife Research Laboratory, SIU-C

July 1 through September 30, 1987

STUDY VII. STATUS OF RUFFED GROUSE REINTRODUCTIONS IN ILLINOIS.

Job A. Fall Juvenile/Adult Ratios

Twenty-one clover-leaf traps were established beginning 25 Aug. within and around the 1982, 1983 and 1986 release areas (see Appendices for trap locations). Eleven grouse (10 different individuals) were captured in 538 trap nights through 21 September. Each bird was sexed, aged, weighed, leg-banded if necessary and released at the trap site (Table 1). Two females and 1 male juvenile grouse were captured. Only 1 of the 7 adult grouse caught had not been previously banded (#427). One adult male (151) that was released in 1982 and recaptured in 1986 was again retrapped at the 1986 recapture location; this bird has survived 5 years.

Illinois Department of Conservation (IDOC) J. Garver and J. Kube planned trapping operations and assisted in trap monitoring. IDOC biologists T. Michetich and M. Murphy helped establish traps and monitor.

Job B. Juvenile Dispersal and Habitat Utilization

Poncho mounted radio transmitters (Wildlife Materials, Inc.) were put on the 3 juveniles captured. The mounted transmitters all weighed

less than 11.5 g and the percent transmitter to body weight ranged from 2.2 - 2.3 g (Table 2). A twice weekly monitoring schedule was established to detect any dispersal from the capture site. To date, no significant dispersal has occurred. More frequent monitoring will be employed to determine habitat selection and utilization on a seasonal and annual basis.

Job C. Spring Drumming Counts

Radio-transmitters were placed on adult males to permit location of drumming areas in Spring 1988 and to determine if these males are detected during planning drumming surveys. The transmitter packages ranged from 1.8 - 1.9% of body weight (Table 2).

Job D. Analysis and Report

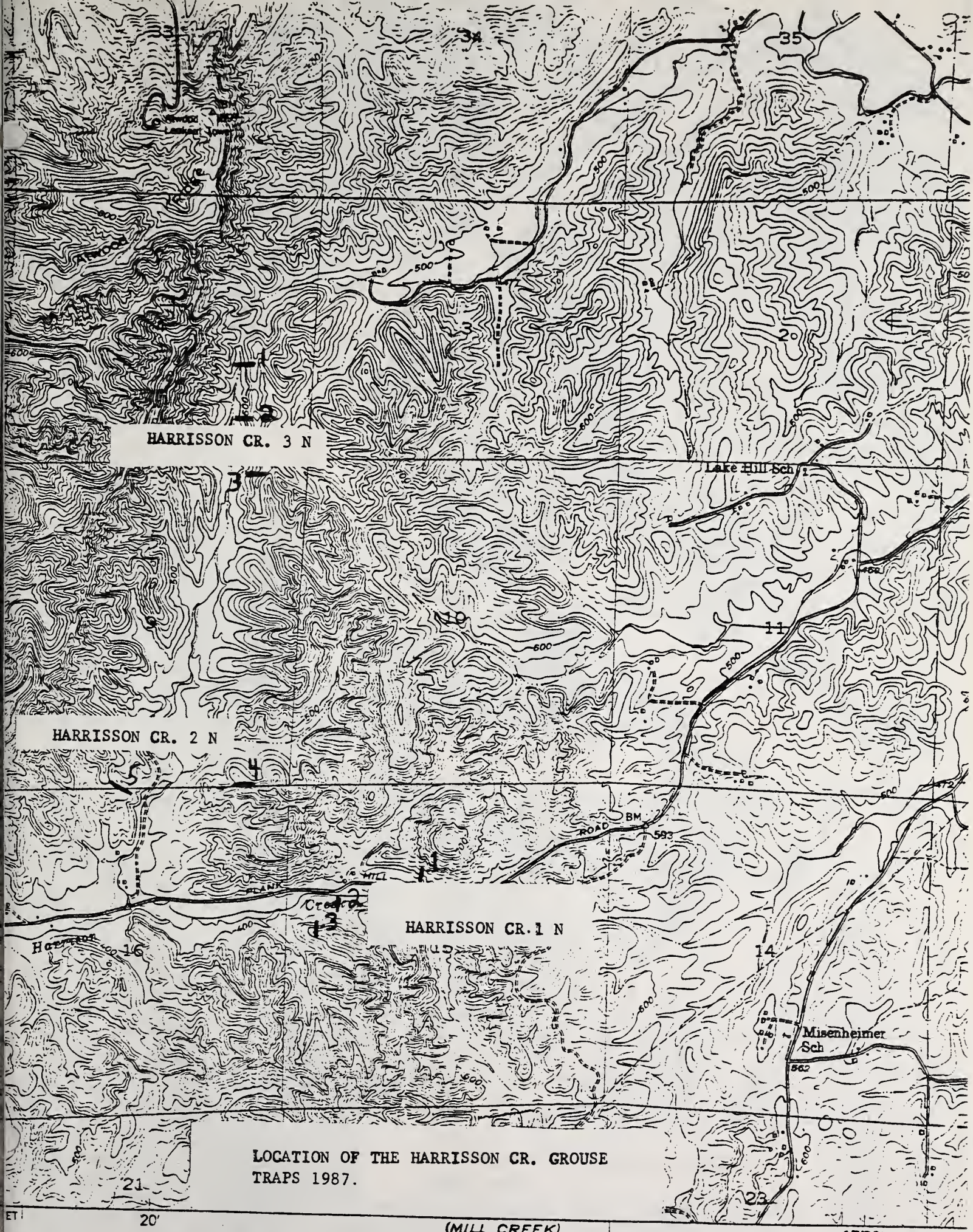
Inactive this quarter.

Table 1. Summary of grouse trapping data through 21 September, 1987.

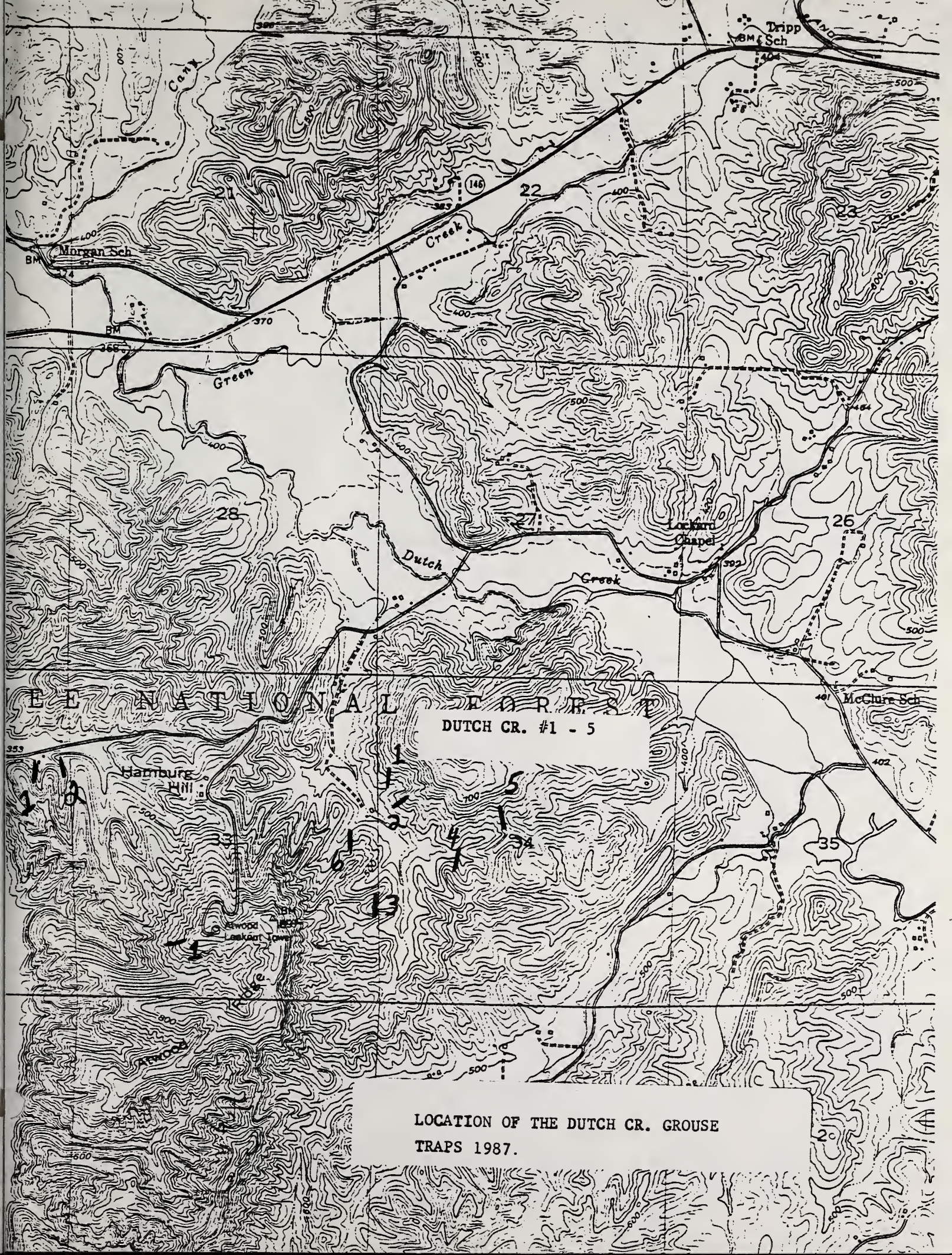
AGE	SEX	TRAP DATE	LOCATION	BAND#	COMMENTS
ADULT	MALE	8/26/87	DUTCH CR.(#3)	333	RELEASED DUTCH CR. 3 9/5/86
JUV.	FEMALE	8/27/87	LINGLE CR. EAST(#2)	401	NEW BAND
JUV.	FEMALE	8/28/87	LINGLE CR. EAST(#2)	402	NEW BAND
ADULT	MALE	8/28/87	LINGLE CR. EAST(#2)	373	TRAPPED 8/31/86 BIG INCH CLEARCUT
ADULT	MALE	8/29/87	HARRISSON 1 N (#3)	377	RELEASED 9/9/86 HARRISSON 1 N
ADULT	FEMALE	8/29/87	HARRISSON 1 N (#3)	56(IL) G2812(IN)	RELEASED 10/15/82 DOGWOOD FLATS
JUV.	FEMALE	8/30/87	LINGLE CR. EAST(#2)	402	RETRAP--TRAP INITIALLY 8/28/87
JUV.	MALE	8/30/87	DUTCH CR. (#3)	426	NEW BAND
JUV.	MALE	9/4/87	DUTCH CR. (#2)	427	NEW BAND
ADULT	MALE	9/14/87	DUTCH CR. (#5)	302	RELEASED 9/5/86 DUTCH CR. 2
ADULT	MALE	9/16/87	PINE KNOB SOUTH(#2)	151	BANDED IN INDIANA 1982 RELEASED AT HARRISON CR. RETRAPPED AT PINE KNOB SOUTH 9/4/86.

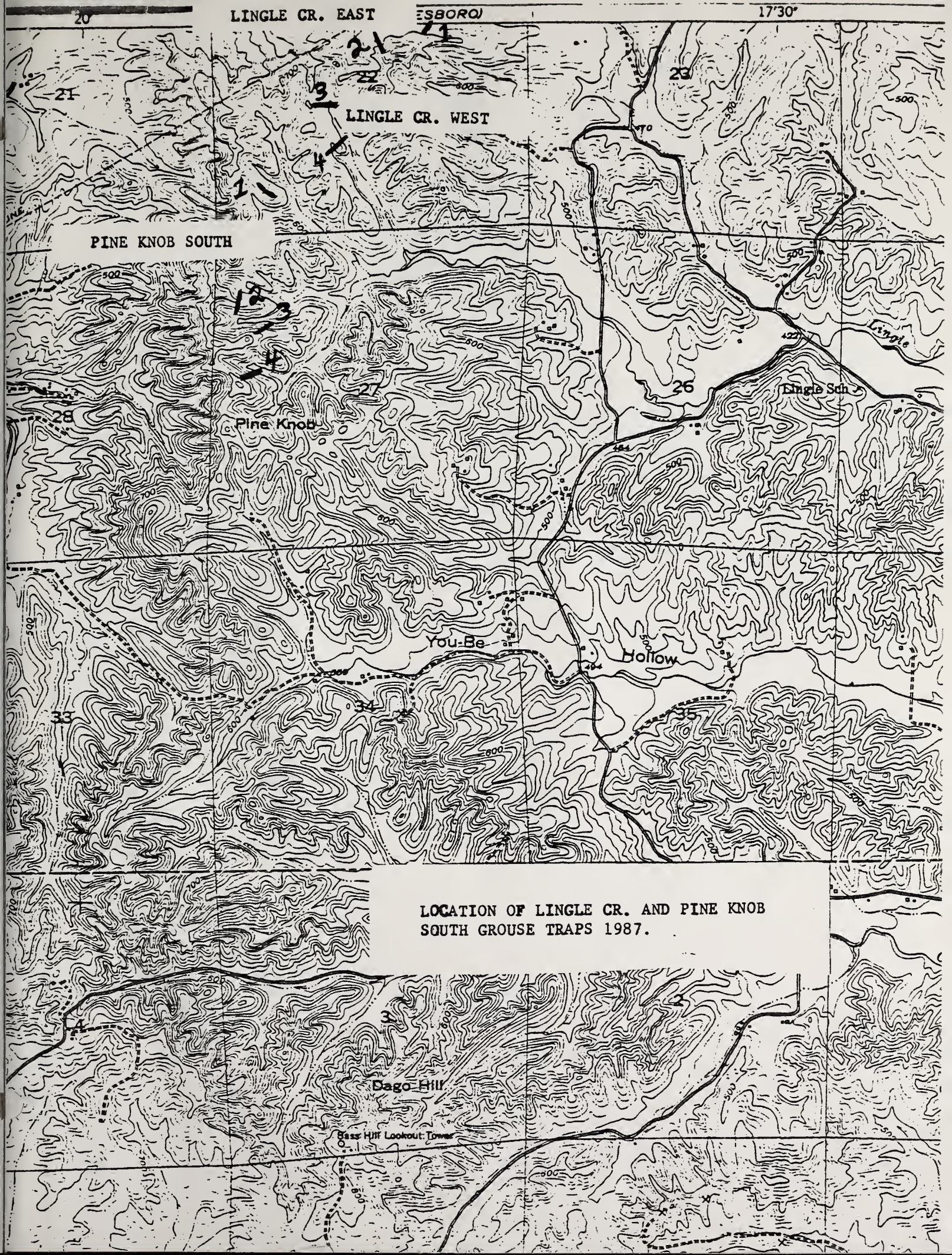
Table 2. Body weights and radio transmitter data of grouse captured through 21 September, 1987.

AGE	SEX	BAND #	WEIGHT	FREQUENCY	TRANSMITTER RADIO WEIGHT	TRANSMITTER % BODY WT.
ADULT	MALE	333	590 g	148.230	10.5 g	1.8
JUV.	FEMALE	401	450 g	148.330	10.3 g	2.3
JUV.	FEMALE	402	520 g	148.056	11.5 g	2.2
ADULT	MALE	373	580 g	-------	------	---
ADULT	MALE	377	650 g	-------	------	---
ADULT	FEMALE	56(IL) G2812(IN)	580 g	148.154	11.6 g	2.0
JUV.	MALE	426	450 g	148.076	10.3 g	2.3
ADULT	MALE	427	560 g	148.379	10.5 g	1.9
ADULT	MALE	302	605 g	148.358	11.4 g	1.9
ADULT	MALE	151	600 g	148.311	11.2 g	1.9



LOCATION OF THE HARRISSON CR. GROUSE TRAPS 1987.


Tripp Sch
Morgan Sch
Green
Creek
Dutch
Creek
Lockard Chapel
McClure Sch
Hamburg Hill
Atwood Lookout Tower
Atwood
Ridge
E NATIONAL FOREST
DUTCH CR. #1 - 5
LOCATION OF THE DUTCH CR. GROUSE TRAPS 1987.



LOCATION OF LINGLE CR. AND PINE KNOB SOUTH GROUSE TRAPS 1987.